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# A TEXT-BOOK

ON

# PRACTICAL OBSTETRICS

BY

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FOURTH EDITION, REVISED AND ENLARGED

**Illustrated with Forty-seven Full-Page Photographic Plates and One Hundred and Sixteen Illustrations in the Text**

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# PREFACE TO FOURTH EDITION.

THIS edition constitutes practically a new book, such have been the vital changes in practice and in technique. The collaboration of Dr. Simon Marx has been secured, a man well known as an expert in the art.

In the chapter on "Anatomy and Physiology," only the essentials are stated, for reason given in the preface to the first edition. The latest views on bacteriology and the toxæmias have been added, and the entire subject of the surgery of labor and of the puerperal state has been re-written. A number of new full-page plates have been added and such new engravings as have appeared necessary in order to amply elucidate the text.

Above all, the original aim of the work has been maintained: that is to say, *brevity*, *accuracy* and *practicability*. *Consensus of opinion* takes the place of *theory* and *hobby*.

NEW YORK, January, 1909.

.321

# PREFACE TO FIRST EDITION.

THE last decade has witnessed not alone progress in the practice of obstetrics, but also change in methods of instruction. The clinical teacher is no longer satisfied with grounding his students in the theory of the art, but he aims, as far as his opportunities will allow, to give his classes that practical instruction which alone enables them to follow understandingly the normal course of pregnancy and of labor, as also to recognize and to cope with the emergencies. The teaching of obstetrics, therefore, has very properly become more practical and less theoretical. This is the inevitable outcome of that higher medical education which aims at thorough grounding in every science before the student is deemed competent to practice. Above all are such methods requisite in case of the science we are dealing with, since familiarity with the phenomena of pregnancy, and of labor, and of the puerperal state, as witnessed in the living and at the bedside, best fits the student for the great responsibilities of his chosen calling. Rarely, nowadays, is the student—filled with theory, and this alone—licensed to care for woman in labor. Practice on the manikin and study in the lying-in room have taught him that, however sound theory be, it cannot be made to uniformly fit the individual case, but that the course of action must alter with the concurrent circumstances.

Before undertaking the study of obstetrics, the student should be well grounded in anatomy, physiology, embryology, and pathology, and therefore there is no longer call for the text-book of the present being filled with abstract knowledge which can, to better advantage, be secured in works dealing specifically with such subjects. When the student has been drilled in the preparatory branches, he wishes to find in his treatise on obstetrics only such data of an anatomical and embryological nature as are essential to the amplification of obstetric teaching. He seeks for *facts* in regard to pregnancy and labor and the puerperal state, and looks to his clinical teacher for such statement of theory as in the opinion of the latter may seem judicious. Similar remarks are applicable to statistical data. Too frequently the student rises from his study confused by the wealth of statistics which, it has been well said, can be made to prove anything.

The student, then, grounded in the facts and after practical exemplification of these facts, is surely better qualified for actual practice than he who is constantly endeavoring to make fact accord with theory.

To-day the major part of obstetric practice is founded on *fact.* Where divergent views obtain, the weight of authority is on the one or the other side; at least, it is safe to teach that which commends itself to the majority of teachers, even though in a very short time further experience may cause a modification in the teaching. The general practitioner, amidst the activities of his calling, when in search of information, wishes to secure it without the loss of time entailed in searching through a mass of theory and statistics. His personal experience will teach him if the statement he reads in the work he consults is valid, or, in case he lacks such experience, knowing that the given statement commends itself to the majority of clinical teachers, he will not hesitate to test it.

On such grounds the present work has been prepared. It aims at being a guide to practice. It is clinical in its teaching. It is direct in its statement wherever *facts* warrant such directness. Such should be the aim of all clinical teaching. Anatomical and embryological and pathological data are alone inserted when essential. Whenever there appears ground for difference of opinion as to fact, that which preponderates is given, even though liable to change. The results which are daily secured in general surgery through resort to timely operation are obtainable in obstetrics if the same principle be held in view. As regards obstetric surgery, its key-note is *election.*

This section, further, being written from a teaching basis, is necessarily imbued with the personality of the authors, and is, therefore, not burdened with literature references and statistical data. The latter have alone been introduced, when necessary, in order to assist in the elucidation of some disputed point.

The illustrations have been prepared and selected with the special end in view of teaching graphically. The works of Barnes, Charpentier, Lusk, Cazeaux, and Oscar Schaeffer, in particular, have furnished many of the wood-cuts, and the authors hereby express their obligation. The photographic plates have been prepared from nature under the personal supervision of the authors, and fidelity to nature has been the aim rather than attempt at artistic effect. It has not been deemed advisable to insert the numerous wood-cuts which from time immemorial have been copied from one work to another, since the majority teach nothing which cannot be learned to better advantage at the bedside,—indeed, which can only be properly learned there.

In this connection the authors desire to record the deep obligation they are under to Dr. Simon Marx, the Assistant Obstetrician to the Maternity Hospital, for time expended and the care taken in the securing of the photographic plates.

In the hope that this volume may prove helpful to the student in the acquisition of knowledge and to the practitioner as a reliable guide, and on the basis of honest desire to promote progress in obstetrics, the authors offer it to their professional brethren.

NEW YORK, September, 1895.

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# PART I.—Pregnancy.

ANATOMY AND EMBRYOLOGY.

DIAGNOSIS, DIFFERENTIAL DIAGNOSIS, DURATION, AND HYGIENE OF PREGNANCY.

PATHOLOGY OF PREGNANCY.

DIAGNOSIS OF THE PRESENTATION AND OF THE POSITION OF THE FŒTUS.

# CHAPTER I.

## ANATOMY AND EMBRYOLOGY.

### (*a*) ANATOMY.

THE genital organs of woman are divided into two groups: external and internal. The external are known as the organs of copulation, and the internal as organs of reproduction.

In the former group are included the mons veneris, vulva, and vagina. In the latter group the uterus, Fallopian tubes, and ovaries.

### MONS VENERIS.

The mons veneris is situated at the lower part of the anterior abdominal wall. It is trapezoid in shape and limited above by a transverse sulcus separating it from the hypogastric region. It lies anterior to the pubic symphysis and over the lower anterior abdominal muscles. It is covered with coarse hair after the establishment of puberty and is made up of fibrous and elastic connective tissue covered by skin. Under the skin we find a fairly well marked amount of adipose tissue.

### VULVA.

The vulva is composed of the following structures: The labia majora, labia minora, clitoris, vestibule, bulbs of the vestibule, fossa navicularis, and posterior fourchette.

*Labia Majora.*—The labia majora are convex folds of adipose tissue on either side of the median line extending downward and backward from the mons veneris. They lie on the anterior surface of the descending rami of the pubes and ascending rami of the ischium. They contain a certain amount of fibrous and elastic connective tissue, together with the adipose tissue. They meet anteriorly at the anterior commissure and posteriorly at the posterior commissure.

At the posterior commissure we find comparatively little adipose tissue. There is scarcely anything but skin and a small amount of underlying connective tissue. This thin cutaneous fold is called the posterior fourchette. The skin covering the labia majora is, as a rule, darker than that of the body immediately adjacent.

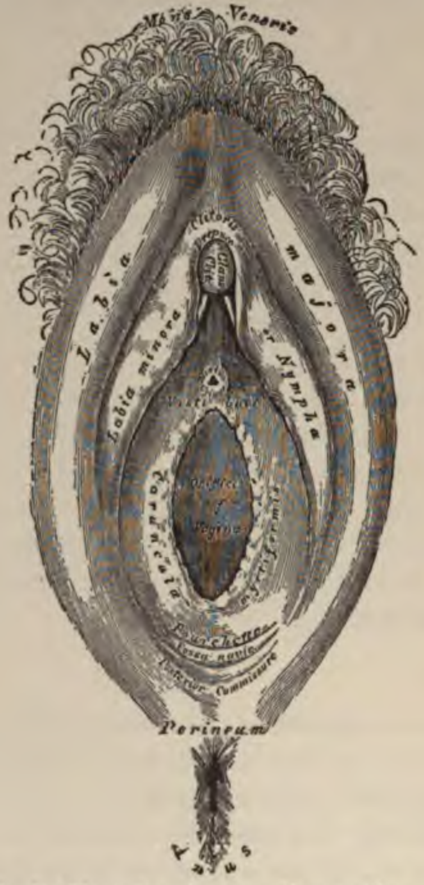


Fig. 1.—The external organs of generation.

In the virgin the surfaces of the labia majora are always in contact. In the parous woman the opposite condition of affairs exists. Here there is a marked flaccid and gaping condition of the parts. In the upper part of the labia majora we find the insertion of the round ligament of the corresponding side, and occasionally a pouch of peritoneum continues downward with the ligament into the tissues of the labium majus and well under the fibrous connective tissue, giving rise to the canal of Nuck.

*Labia Minora.*—The labia minora are two folds of skin much less extensive as regards size than the labia majora. They lie just within the labia majora and are triangular on cross-section. Their bases are in contact with the labia majora and they have an inner and outer surface covered with sebaceous and sudoriferous glands. They extend from the clitoris downward and backward to a point midway between this organ and the posterior commissure. In some subjects they meet posteriorly and form a complete circle within the labia majora. Above and in front they split into an upper lip forming the prepuce of the clitoris, and a lower lip, forming the frænulum of the same organ. In some African women we find these labia so elongated that they almost touch the knees.

*Clitoris.*—The clitoris is a small, round body in the median line of the vulva just below the anterior commissure. It is made up of three parts: the crura, body, and glans. It is about an inch in length and is abundantly supplied with nerves and blood-vessels. The organ itself is the analogue of the male penis, except that it lacks the corpus spongiosum and urethra. It is made up of fibrous and elastic connective tissue, with many interspaces, in which the blood collects during the process of erection. The body is attached to the anterior surface of the pubic symphysis. The crura are joined to the rami of the pubes and ischium. These latter processes are covered with the erector-clitoridis muscle. The organ gets its nerve-supply from the terminal branches of the pudic nerve. The arteries are the terminal branches of the internal pudic, and are known as the dorsal artery of the clitoris and the artery of the corpus cavernosum. The veins empty into the dorsal vein accompanying its artery. The lymphatics, of which there are a great number, communicate with the superficial inguinal glands.

The clitoris is supposed to be the centre of sexual pleasure in the female. It becomes erect and arched during copulation and presses against the dorsum of the penis.

*Vestibule.*—The vestibule is a triangular-shaped space with its base below at the anterior border of the vaginal orifice. Its apex is just below the clitoris. It is lined with mucous membrane which is continuous with that lining the under surfaces of the labia. In the median line of this region we find the meatus urinarius, or urethral orifice. There are two rather deep sulci in each vestibule—one on either side of the meatus urinarius. The vestibular mucous membrane is well supplied with racemose mucous glands.

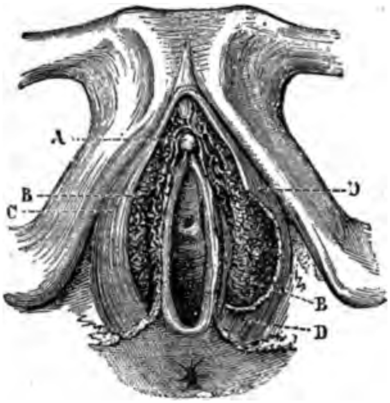


Fig. 2.—Vaginal bulbs. *A*, clitoris; *B*, vulvo-vaginal gland; *D*, bulbs.

*Vaginal Bulbs.*—The bulbs of the vagina, or vestibulo-vaginal bulbs, are found on either side of the vagina. They are rounded processes with tapering extremities. The anterior extremity of each bulb is at the clitoris and the posterior extremity is found in close contact with the Bartholin gland. The bulbs are nothing more than large venous plexuses inclosed in fibrous connective tissue. There are a great many nerve-filaments on them which communicate with the pudic nerve. The veins in front empty into the veins of the corpus cavernosum of the clitoris and those behind have access to the superficial veins at the vaginal orifice. At a point just below the clitoris the veins of the bulbs communicate with each other, giving rise to the pars intermedia.

*Fossa Navicularis.*—The fossa navicularis is, as the name implies, a boat-shaped cavity lying between the posterior border of the vaginal orifice and the posterior commissure of the vulva. To get its true shape we must separate the labia sufficiently to bring the apex of the space forward and nearly to the anterior boundary-line. It is then seen to be made up of a fold of tissue called the fourchette and a hollow (the *fossa navicularis*).

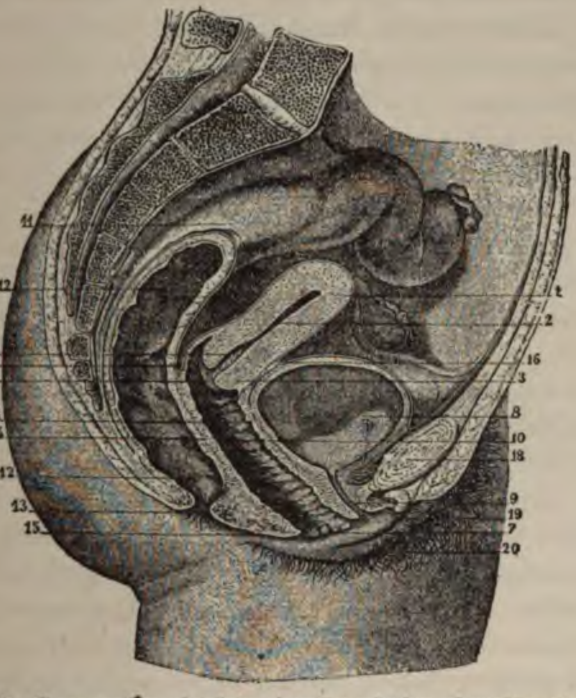


Fig. 3.—Cross-section of pelvis, showing relation of vagina, uterus, bladder, and rectum.

*Vulvo-Vaginal Glands.*—The vulvo-vaginal glands, or glands of Bartholin, lie on either side of the vaginal orifice. They are rather small—about the size of an ordinary bean. They are covered by the perineal fascia and lie inside the sphincter-vaginæ muscle. They are racemose mucous glands, and are capable of producing a large amount of mucus. The orifice of each gland lies just inside the labium majus at a point nearly opposite the middle point of the vaginal orifice. These glands become distended during coitus or masturbation and discharge their contents from time to time.

The external genitals of the female are supplied with arterial blood from the terminal branches of the internal pudic and communicating branches from the external pudic. The veins accompany the arteries. The lymphatics enter the superficial inguinal glands, which, in turn, communicate with the deep inguinal and external iliac glands. The nerves are joined to the superficial perineal nerves, the inferior pudendal nerve from the small sciatic and the inferior hypogastric plexus of the sympathetic.

## VAGINA.

The vagina is defined as a mucous slit in the pelvic floor. It extends from the uterus backward, downward, and forward at an angle of 60° to the horizon. At all times, except when distended by some foreign body, the anterior and posterior walls are in contact. It is $2\,^1/_2$ inches in length on its posterior border and 2 inches in length on its anterior border. At its upper end it is $1\,^1/_2$ inches wide. When its walls are in contact, they assume an H-shaped character. The anterior and posterior walls are in contact with one another, making one line of union, and the lateral walls are flush against this same opposing line. By the presence of the cervix above we have a sort of ball and socket joint—the vaginal walls fitting closely about the lower extremity of the uterus. The spaces about the cervix are called anterior, posterior, and lateral fornices. The vagina, as a whole, is often considered as a truncated cone with base above and apex at the vulva. It is composed of an outer sheath of connective tissue, an inner muscular coat of longitudinal and transverse muscular fibres, and still further interior the mucous layer of flat epithelial cells. The question, as to whether or not glands are to be found in its mucous membrane has never yet been settled.

This mucous membrane is arranged in rugous-like processes on the anterior and posterior walls. The rugæ pass outward from a central column like the teeth in a comb. They are much less in evidence after parturition.

The blood-supply of the vagina is quite extensive. The arterial supply is derived from the vaginal, uterine, vesical, and internal pudic. The vaginal veins communicate with those of the bladder, rectum, uterus, and broad ligament. The lymphatics in its lower fourth empty into the superficial inguinal glands, while those of the upper three-fourths enter the internal iliac glands.

### HYMEN.

The hymen is a fold of mucous membrane which is continuous with that from the vagina. It is made up of blood-vessels, nerves, lymphatics, and connective tissue.

It assumes different shapes in different women. In some it is a ring with a circular opening. In others it may be either crescentic, cribriform, or even imperforate. The edges of the crescent may be either high or low.

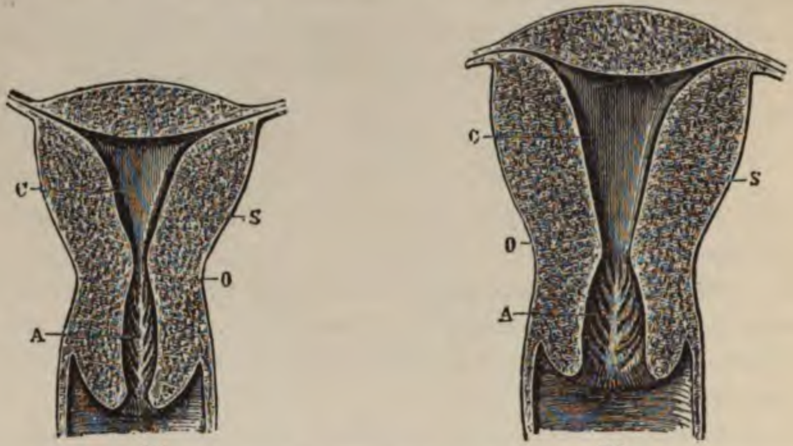
In infants the hymen is generally made up of two folds of tissue meeting in the median line. The membrane is generally ruptured in one or more places, after complete coitus. After parturition we have only two or three tabs of tissue left, which are, in reality, the cicatrized remains of the original membrane. These prominences are called the carunculæ myrtiformes.

### THE UTERUS.

The uterus is a hollow body shaped more or less like a flattened pear with the base upward and apex downward. It is composed of body and cervix. That part of the body lying above the entrance of the Fallopian tubes is called the fundus uteri. The uterus is in relation with the bladder in front, the rectum behind, the vagina below, and the small intestines above.

The cervix is divided into supravaginal and infravaginal portions. The latter part is about $^1/_2$ inch in length and is split at its lower end by a transverse slit in the centre of which we find the external os. This slit divides this part of the cervix into anterior and posterior lips. The posterior lip is really longer than the anterior because of the long posterior vaginal fornix, while the anterior lip again hangs, as a rule, lower in the vagina.

The body of the uterus is flattened anteriorly and convex posteriorly. Its inner surfaces are usually almost in contact with one another. The fundus, or that part of the body above a horizontal line drawn through the entrance of the Fallopian tubes, is convex on its upper surface and concave on its inner surface.



(*a*) (*b*)

Fig. 4.—(*a*) Virginal uterus. (*b*) Parous uterus. *A*, isthmus; *O*, internal os; *C*, body of uterus and cavity.

The uterine cavity, for means of description, may be divided into three parts: the cervical canal, the isthmus, and the cavity of the body. The cervical canal is spindle-shaped in outline, and 1 inch in length. It is lined with mucous membrane that is arranged in an arbor-vitæ manner: *i.e.*, the mucous folds radiate from a central column like the branches of a tree. The isthmus is circular in outline. The cavity of the corpus uteri is rather triangular in outline. Its walls are smooth and lined with mucous membrane.

The uterus is from 2 to 3 inches in length, $1\,^{1}/_{4}$ to $1\,^{3}/_{4}$ inches wide, $^{7}/_{8}$ to $1\,^{1}/_{8}$ inches thick, depending, of course, on the fact as to whether or not parturition or any pathological processes have ever been present.

The uterine wall is composed of three layers: serous, muscular, and mucous. The serous coat is the peritoneum that is reflected from the rectum over the whole of the posterior surface of the cervix, body, and fundus, and on the anterior surface of uterus to a point on the cervix opposite the internal os. The muscular coat which makes up the chief bulk of the wall of the uterus is divided into three layers: outer, middle, and inner. The outer layer is longitudinal in direction, and not nearly as thick as the middle coat. Its fibres entirely surround the uterus, and from this they pass to help make up the various ligaments attached to the organ. The middle coat is longitudinal, transverse, and circular in direction. The inner layer is transverse, and forms the basement membrane for the lining mucous membrane of the uterine cavity.

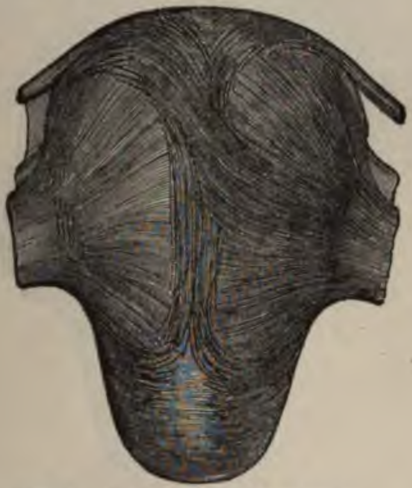


Fig. 5.—External muscular layer.

The mucous membrane of the body of the uterus is different from that lining the cervical canal. It rests directly on the underlying muscular tissues and is composed of connective tissue dotted here and there with round cells, between which cells we find the utricular glands. The glands have a basement substance and are lined with columnar ciliated epithelial cells.

In the cervix we find a different set of conditions. Here the mucous membrane is thicker. It has a muscularis mucosæ in contradistinction to that lining the cavity. The glands are racemose and lined with cuboidal epithelium. In the body of the uterus we find the epithelium ciliated in all places except in the depression of the arbor vitæ. Here the cells are goblet-shaped.

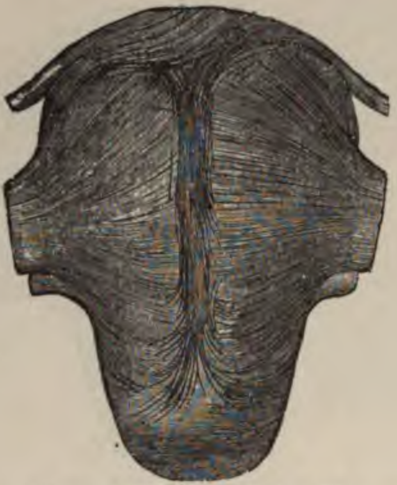


Fig. 6.—Internal muscular layer.

The uterine ligaments are 8 in number: 2 vesico-uterine, 2 utero-sacral, 2 round, and 2 broad ligaments. The vesico-uterine ligaments are small folds of peritoneum extending from a point opposite the internal os to the bladder. The utero-sacral ligaments pass from the middle point of the second sacral vertebra to the posterior surface of the uterus at a point directly behind the internal os. These latter ligaments are made up of fibrous and muscular connective tissue. The muscular tissue is derived from the external muscular tunic of the uterus itself. In some subjects we find these utero-sacral ligaments very highly developed. They have concave internal borders which help to form the upper boundary of Douglas's *cul-de-sac.* They pass around in front of the cervix and unite with the anterior vaginal wall, thereby forming a suspensory ligament for the lower segment of the uterus.

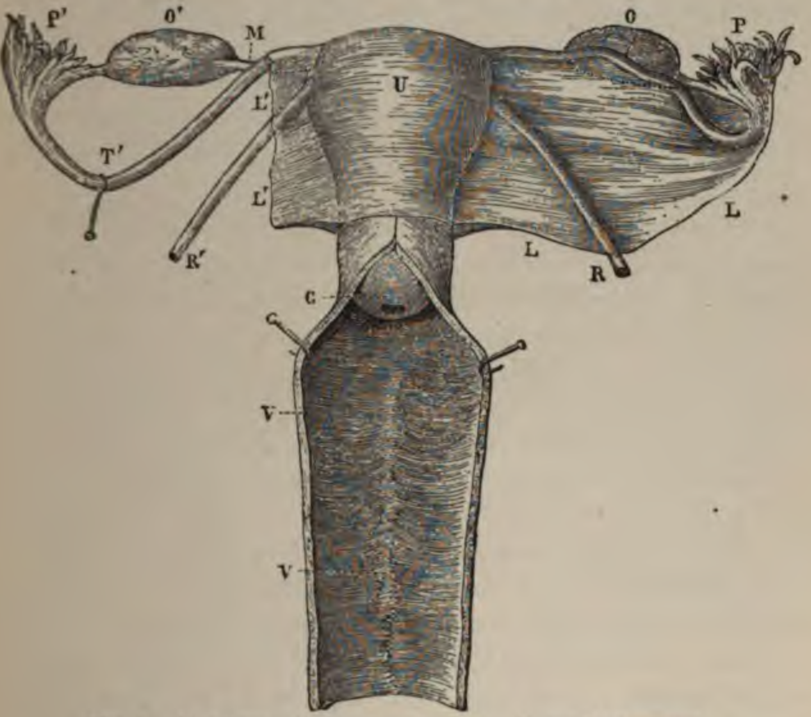


Fig. 7.—*U*, uterus; *O*, ovary; *T*, tube; *R*, round ligament; *P*, pavilion of the tube; *V*, vagina.

The broad ligaments are two in number, situated one on either side of the uterus. They are rather quadrangular in outline and triangular in cross-section, the apex being upward and the base downward. They are attached to the sides of the uterus, being chiefly composed of peritoneal reflections from that body. They extend from the uterus to the side-walls of the pelvis. Their *line* of attachment here is from a point midway between the sacro-iliac synchondrosis and the ilio-pectineal eminence downward between the great sacro-sciatic notch and obturator foramen to the ischial spine. In the anterior portion of this ligament we find the round ligament, at the apex the Fallopian tube, and behind and below the ovarian ligament and ovary. From the ovary to the lateral wall of the pelvis we have the infundibulo-pelvic ligament as a continuation of the Fallopian tube extending from uterus to ovary. Within the broad ligament we find connective tissue, blood-vessels, nerves, lymphatics, and a small amount of unstriped muscular tissue. This tissue at the sides of the cervix uteri is called parametric tissue by reason of its location. It is very readily influenced by any of the pathological processes.

The round ligaments are situated one on either side of the uterus, springing from a point just below and in front of the entrance of the Fallopian tube, and passing upward and outward, then inward and forward around the bladder to the internal inguinal ring. Having reached this point, the ligament passes through the inguinal canal and, emerging from the external inguinal ring, it divides into three slips, one going to the mons veneris, another to the labium majus of the corresponding side, and still a third slip to the pubic symphysis. These ligaments vary as regards their size and consistency. They are composed of fibrous and muscular connective tissue, blood-vessels, nerves, and lymphatics. At their uterine end they are generally covered by peritoneum, which continues to cover them until the internal inguinal ring is reached, at which point it usually ceases. We now and then find the peritoneum forming a pouch about the ligament within the inguinal canal and extending even beyond the external inguinal ring. This occasionally becomes the seat of hydrocele. The above peritoneal prolongation is called the canal of Nuck, and when hydrocele exists we call it hydrocele of canal of Nuck. Intestine and prolapsed ovaries sometimes find their way down in this canal. The ligament is pierced by an artery and vein. The artery is generally one of the branches of the epigastric.

The arterial blood-supply of the uterus is derived from two main sources of supply: the ovarian and uterine vessels. The ovarian artery comes from the aorta and the uterine from the internal iliac. The uterine artery enters the parametric space by passing behind the peritoneum on the posterior wall of the pelvis, and, coursing downward to a point opposite the internal os uteri in the base of the broad ligament, it passes in front of the *ureter* at a distance of $^1/_2$ inch from the cervix. Here it gives off numerous branches to the upper vagina and cervix and a large branch that completely encircles the cervix by uniting with its fellow of the opposite side. This special branch is called the circular uterine artery. After these branches are given off, the uterine artery passes upward along the sides of the uterus, giving off a great many small branches that enter the substance of the uterine wall at right angles to its surface. Still higher up in the broad ligament and quite close to the uterus, we find it making anastomoses with the ovarian artery.

The *veins* form a large net-work of sinuses in the wall of the uterus. They then pass outward, and, gradually becoming larger and larger, unite to form the true uterine veins, which anastomose with the ovarian veins above and the vaginal and vesical plexuses below.

The *nerve-supply* of the uterus is arranged as follows: Branches from the second, third, and fourth sacral nerves pass downward to the sides of the cervix and unite with branches of the hypogastric plexus. Their union is marked by a large ganglion on either side of the cervix. From this ganglion we have given off cervical ganglion branches that pass to the mucous membrane and muscle-cells in the muscular layers covering the uterus.

The *lymphatics* begin in the mucous membrane as large spaces lined with endothelium. The same sort of spaces is also found in the muscular tunics. Going outward, they unite to form larger lymphatic trunks that enter the internal iliac glands *above*, while those from the lower part of the uterus and cervix pass out through the obturator foramen and join with the superficial inguinal glands.

### FALLOPIAN TUBES.

The Fallopian tubes are two long, round tubes that extend from the uterus to the ovary. They are very slender in outline and measure from 3 to 6 inches in length. They lie in the highest part of the broad ligament, above and behind the round ligament, and in front of and above the ovarian ligament. From the uterus they pass outward, and then backward and downward to the ovary, oftentimes completely investing the same. These tubes are divided into three portions: isthmus, ampulla, and fimbriæ. The *isthmus* is the first portion, or that beginning at the uterine mucous membrane and extending through the uterine wall to a point just external to the serous coating of the organ. Its ordinary calibre is that of a very fine bristle. The *ampulla* is the dilated portion of the tube. Its calibre is at least four to six times that of the isthmus. The cavity here is rather circular in outline. The *fimbriæ* are the extremities of the tube. They are situated about and near to the ovary. One of these processes is gutter-shaped and attached to the ovary. It is called the *fimbria ovarica.* In the middle of these many fimbriated processes of the Fallopian tube can be seen the orifice of the tube proper. It is called the *ostium abdominale.* The Fallopian tubes are supposed either to grasp the ovary at such points as Graafian follicles are about to rupture or, at least, to pose

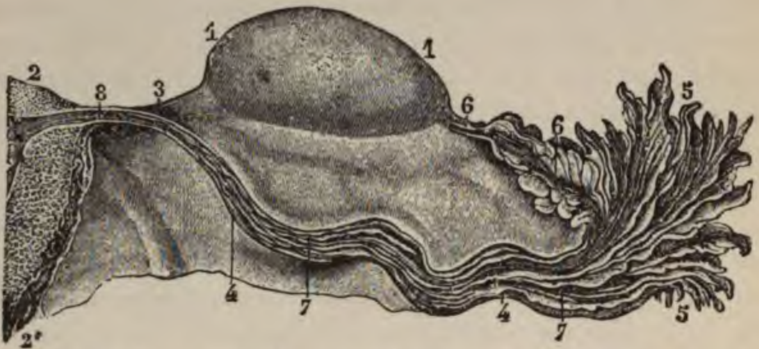


Fig. 8.—Cross-section of broad ligament, showing tube and ovary.

themselves in such a manner as to catch and sweep up into their canal the ovum after it has left the ovary.

These tubes are covered with an outer longitudinal muscular coat and an inner circular coat. The muscle-fibres here are derived from those of the uterus.

The mucous membrane is of the columnar ciliated variety. The ciliæ are seen to bend toward the uterine cavity when put in motion from any cause. This membrane is thrown into longitudinal folds throughout the greater part of each tube. There are no secreting glands present.

The ovarian *artery*, with some few branches from the uterine, supplies the tubes with arterial blood. The *veins* enter the so-called pampiniform plexus of the broad ligament. The nerves are joined to the inferior hypogastric plexus of the sympathetic. The lymphatics of the Fallopian tubes pass into the lumbar glands, along with those from the ovary.

The chief function of the tubes is to convey the ovum from the ovary to the uterus whether in an impregnated condition or not, as the case may be. When it is in a fertile condition, however, it is thought that it gives some source of nourishment to the ovum during the first few days of embryonic life.

## OVARIES.

The ovaries are two bodies situated at the sides of the uterus, below, behind, and to the inner sides of the Fallopian tubes. They measure 1 $^1/_2$ inches in length, about 1 inch in breadth, and $^1/_2$ inch in thickness. They are covered with flat columnar epithelium, and project through the posterior layer of the broad ligament. They are placed in the pelvis in such a manner as to occupy a diagonal position, having an anterior inner and posterior outer extremity, an antero-external and postero-internal borders, and an antero-outer and postero-inner surface. The ovary is attached to the uterus by the ovarian ligament, and to the side-wall of the pelvis by the infundibulo-pelvic ligament. Its position is also more or less fixed by the fimbria ovarica of the Fallopian tube. The hilum of the ovary is that part at which the blood-vessels enter and leave the ovary. The ovary is convexly flattened, like the uterus, on its anterior surface and convex on its posterior surface.

The blood-supply is quite extensive. The ovarian *artery* furnishes the arterial blood. It enters at the hilum after leaving the abdominal aorta and immediately subdivides into numerous branches. These branches again subdivide, and finally terminate in the tunics of the Graafian follicles. The veins empty into the pampiniform plexus of the broad ligament. On the *right* side this plexus empties direct into the inferior vena cava. On the *left* side this same plexus empties into the left renal vein. Its point of entrance here is not guarded by a valve as it is on the right side when this same plexus of the broad ligament enters the inferior vena cava.

The *lymphatics* begin around the follicles, and, leaving the ovary at the hilum, enter the lumbar glands.

If we examine an ovary in cross-section we can easily see that it is made up of two parts, like many other organs of the body: an outer cortex and an inner medulla. The cortex is the true covering of the ovary. It is made up of fibrous connective tissue and unstriped muscular fibres. Just beneath it we find a great many Graafian follicles, to be hereafter described in connection with the development of the ovum and fœtus. These follicles are in various stages of development and of various sizes. In the medulla of the ovary we find the connective tissue much more abundant and loose in character and well supplied with blood-vessels.

### PAROVARIUM.

The parovarium is nothing but the remains of that embryonic structure the Wolffian body. It is a small body situated between the dilated portion of the Fallopian tube and the ovary. It lies between the layers of the broad ligament. It is triangular in outline, with apex downward and outward. It consists of a number of fine tubules lined with columnar ciliated epithelium. These tubules all empty into a large transverse tube, which, in the great majority of cases, ends as a thick cord near the uterus. This tube and cord constitute the real *Gaertner canal* in some animals. The outer end of this transverse tube is called the hydatid of Morgagni. This process, along with the other smaller tubes, often is the seat of the various forms of cystic degeneration.

### THE MAMMARY GLANDS.

The breasts, or mammary glands, are two rounded prominences situated one on either side of the sternum. They vary much as regards size and consistency. They generally extend from the third to the sixth ribs, and cover that portion of the pectoralis-major muscle that occupies this special region of the body. The breasts are composed largely of adipose and gland tissue. It is the varying amount of these tissues that causes such marked difference in the size of these structures. The overlying skin is generally thin and crossed here and there by rather prominent veins. The mammary tissue or substance proper is made up of from fifteen to twenty lobes, with their excretory ducts, blood-vessels, nerves, lymphatics, and adipose tissue interspersed between these lobes.

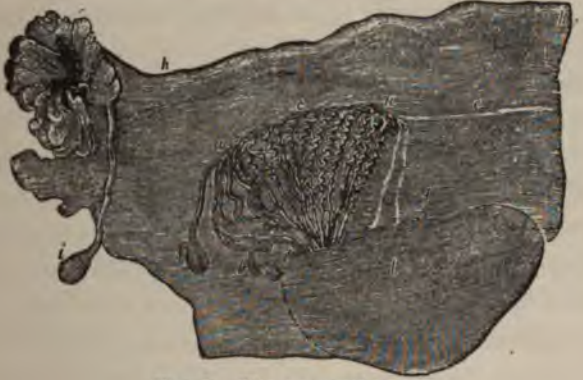


Fig. 9.—The parovarium.

We may have supernumerary breasts and nipples. These may be all on the original breasts or at some little distance from them. The lobes are made up of a number of lobules each with its excretory duct. The lobules are composed of numbers of acini which lead out from the galactiferous glands proper. The excretory ducts unite with one another to form larger ducts called the *true* galactophorous ducts, that lead up to the nipple. These latter ducts are much dilated to act as reservoirs for the milk. When they reach the nipple they contract on themselves, partly from their own containing muscle-fibres and partly from the muscular tissue lying just under the areolæ. These *galactophorous ducts* are surrounded with muscular and elastic connective tissue, and are lined with columnar epithelium like the *acini* of the glands themselves. Milk is produced by the distension of the gland-cells with fatty matter and the subsequent rupture of the same.

*Nipples.*—The nipple is the conical eminence at the summit of the breast. It is covered with skin that is much darker than that immediately adjacent to it. Its size varies in different women. In a non-parous woman it is much smaller and, as a rule, more retracted than it is in those who have borne children. Its surface is covered with a number of papillæ, at whose bases we find the orifices of the lactiferous ducts, and also a few sebaceous glands, whose secretions are supposed to keep the tissues of the nipple in a supple condition. The nipple is made up of muscular and elastic connective tissue, blood-vessels, nerves, and lymphatics. In all probability, the *erectile* power of the nipple is due solely to the presence of muscular tissue.

*Areola.*—Outside of the nipple and at its base we find the areola of a pink color normally, but becoming much darker during and after pregnancy. It is studded with many sebaceous glands, which give it the appearance of the same number of tubercles. During *pregnancy* these become much enlarged. Under the skin of each *areola* we find bands of muscular tissue surrounding the galactophorous ducts in such a manner that they aid very materially in the expulsion of their lacteal contents.

The *arterial* supply of the breasts is derived from the internal mammary and intercostal arteries. The *nerves* communicate with the intercostal and thoracic branches of the brachial plexus. The *veins* accompany the arteries. The lymphatics enter the axillary glands.

Since, in the performance of certain obstetric operations, it is essential that the anatomy of certain organs adjacent to the uterus should be remembered, a brief description of the bladder, ureters, and rectum is appended.

### URETERS.

The ureters are the conducting-tubes for carrying the urine from the kidneys to the bladder. They are about the size of a goose-quill and 16 to 18 inches long. The distance that they travel is much shorter than the real length of the tubes themselves. They begin at the pelvis of the kidney separated from one another by a distance of between 2 and 3 inches. Coursing downward, they remain equally distant apart until they reach the brim of the pelvis. Here on the *left* side the ureter passes under the sigmoid flexure of the colon. On the *right* side it passes under the ileum, lying to the outer side of the inferior vena cava. They then cross the common iliac artery at its bifurcation or the upper end of the branches—the external and internal iliac arteries. They now dip deep into the pelvis, passing downward, backward, and slightly outward; then inward, upward, and forward under the broad ligament, and begin to converge at the base of the bladder. They do *not* meet, but pass behind the uterine artery at a distance of $^1/_2$ inch on either side of the cervix. Crossing the cervix in such a way that they lie below and in front of it, they enter the bladder-wall in an oblique direction. Continuing this direction for $^1/_2$ inch, they finally pierce the mucous membrane of that viscus by a longitudinal slit, being separated from one another by a distance corresponding to $^1/_2$ inch. The trigonic ligament joins their orifices.

As regards composition, the ureters have an outer fibrous coat, a middle muscular coat, and an inner mucous tunic. The muscular coat is made up of an outer circular layer and an inner longitudinal layer of muscular tissue.

In the mucous layer, or tunic, we find, as a rule, three distinct layers of cells: an outer layer of short, pointed cells; a middle layer of long, columnar cells; and a deep layer of round cells. The epithelial cells of the vesical mucous membrane and those of this deep layer resemble one another very closely. The ureteral mucous membrane has no glands in its substance.

The arteries come from the renal, vesical, internal pudic, and ovarian. The veins accompany the arteries. The lymphatic system empties into the lumbar glands, and the nerves communicate with those of the sympathetic system.

### BLADDER.

The bladder is a hollow viscus used as a temporary reservoir for the urine after it leaves the kidneys. The capacity of this organ in women is a trifle greater in most cases than it is in men. It will ordinarily contain from six to eight ounces of urine. It is made up of a base and summit, anterior and posterior walls, and two sides. The base is the thickest part of the bladder-wall. In it we find the openings of the urethra and the ureters, each structure forming the apex of an equilateral triangle whose sides measure roughly 1 inch. The base lies in contact with the anterior vaginal wall and passes upward on the cervix uteri for a distance of nearly $^3/_4$ inch. The summit is the dome of the bladder. From its highest point we find the urachus, one of the false ligaments that passes to the umbilicus. The anterior bladder-wall is just behind the pubic symphysis and anterior abdominal wall. It is not covered with peritoneum except at its uppermost portion. The peritoneum covers the whole of the summit and the posterior wall down as far as the intra-uteric ligament, from which place it is reflected over to the uterus. The vesical wall is $^1/_4$ inch in thickness. It is made up of the serous coat above mentioned, an outer longitudinal and an inner circular muscular coat, and still farther internally of the mucous membrane. Around the urethral orifice of the bladder we generally find the muscular tissue more highly developed than at any other point.

The mucous membrane is rather loosely attached to the underlying muscular wall by means of an intervening substance called the muscularis mucosæ, except at the trigone, at which place it is entirely absent. This mucous membrane is filled with racemose glands and is made up of flat epithelium, which in some deep places gives way to large, pear-shaped cells. The ligaments of the bladder are 9 in number: 4 *true* and 5 *false.*

The anterior, or *true,* ligaments are small bands of muscular and connective-tissue fibres that pass from the bladder to the posterior surface of the pubic symphysis. The lateral *true* vesical ligaments are those portions of fascia that pass down on the sides of the bladder external to the anterior ligaments.

The utero-vesical ligaments are peritoneal folds found connecting the posterior surface of the bladder with the lower anterior surface of the uterus. The lateral ligaments are reflected from the sides of the bladder on to the side-walls of the pelvis.

The superior false vesical ligament, or urachus, extends from the summit of the bladder to the umbilicus.

The *arterial* supply of the organ is derived from the superior, middle, and inferior vesical arteries, that are, in turn, branches of the internal pudic and the uterine, vaginal, obturator, and sciatic arteries. The *veins* arrange themselves in the form of large plexuses that communicate with those of the uterus, vagina, vulva, and rectum, and empty into the internal iliac vein.

The *nerves* are joined with the hypogastric plexuses of the sympathetic and the sacral nerves. The *lymphatic* system is in communication with the hypogastric glands.

### URETHRA.

The urethra is a hollow tube from 1 to 1 $^1/_2$ inches in length, and extends from the bladder to the vulva. It is the normal means of escape for the urine that collects in the bladder from time to time. Its direction is in more or less of a circle, with concavity anteriorly and convexity posteriorly. It is covered by an outer layer of circular muscular fibres and an inner layer of longitudinal fibres. The mucous lining is thrown up into longitudinal folds. In the depressions or sulci between these folds we find many small, pit-like processes, called Morgagni's glands. On close inspection we can discover, in most subjects, just within the meatus urinarius the orifices of two ducts called Skene's tubular orifices. These special tubules pass upward parallel with the mucous membrane for a distance of nearly 1 inch, and are lost in blind extremities in the muscular tissues. The urethra is completely surrounded by a sling-like muscle called the compressor urethræ. It is the real cut-off muscle of the bladder, and lies between the layers of the triangular ligament. This ligament is pierced by the urethral canal and its nerves and blood-vessels. The nerve-supply, as well as the blood and lymphatic systems, are the same as those of the bladder.

### RECTUM.

The rectum is the lowest division of the large intestine, extending from the colon to the anus. It is from 8 to 9 inches in length and about 1 $^1/_2$ inches in width. It has a markedly varying capacity. It begins at the left sacro-iliac synchondrosis, passes downward, backward, and inward over the middle of the anterior surface of the third sacral vertebra, and then forward and downward, lying behind the cervix uteri and vagina. It then turns sharply backward and downward, to terminate in the anus. It is made up of serous, muscular, and mucous layers. The serous, or peritoneal, coat completely invests the first portion, which extends as far down as the third sacral vertebra. It in reality forms a complete mesorectum for the same. The second portion, which lies between the lower extremity of the first portion and that part called the *anal* division, is covered only on its anterior surface. The third, or *anal*, portion is not in contact with this serous membrane.

The muscular layer is divided into an outer longitudinal and an inner circular layer. The outer layer invests equally all sides of the rectum, and is not thrown into thick folds as it is in the various colon divisions. These same fibres are below closely intermingled, the external and internal sphincter-ani muscles and the levator-ani muscle as well. The *external* sphincter-muscle surrounds in an elliptical fashion the lower end of the rectum. It has a thick belly and is purely a voluntary muscle. It is attached posteriorly to the tip of the coccyx by a short ligament. In front it joins the transversus-perinei and sphincter-vaginæ muscles. Its nerve-supply is derived from the anterior branch of the fourth sacral nerve. The *internal* sphincter is about an inch in width, and lies just above the external sphincter. Most of its fibres are derived from the circular layer of the rectum proper. Some additions are obtained from the transversus-perinei and bulbo-cavernosus muscles and the pelvic fascia. It is an involuntary muscle.

The mucous membrane of the rectum is arranged, for the most part, in a longitudinal manner. Near the lower extremity of the organ we find it thrown into numerous folds, called the columns of Morgagni. The depressions between these same columns are called the sinuses of Morgagni. In most subjects about two inches above the anus we find from one to three transverse folds of mucous membrane that are more prominent than those immediately about them. One of these folds is generally found on the anterior wall and two are found on the posterior wall. They are called the valves of Houston. They give a special valve-like character to that part of the rectum, and some anatomists consider them as a *third* rectal sphincter. The epithelium of the rectal mucous membrane is of the columnar type.

The *arterial* blood-supply of the rectum is derived from the superior hæmorrhoidal, a branch of the inferior mesenteric; the middle hæmorrhoidal from the internal iliac; the middle sacral; and the inferior hæmorrhoidal from the internal pudic. The *inferior* and *middle hæmorrhoidal veins* empty into the internal iliac vein, and the superior hæmorrhoidal vein into the superior mesenteric, which is itself a branch of the portal vein.

The *nerves* are joined to the hypogastric plexus and sacral nerves from the cauda equina. The *lymphatics* empty into the sacral glands.

### PELVIC PERITONEUM.

The pelvic peritoneum is a continuation of the abdominal peritoneum, and covers the pelvic organs more or less completely throughout their whole extent. Beginning posteriorly, we find it encircling completely the whole of first part of the rectum, forming the mesorectum. The second portion of this part of the intestine is covered only on its anterior surface, and the third portion not at all. From the rectum it is reflected over to the upper posterior inch of the vaginal wall, the whole posterior surface of cervix and corpus uteri giving rise to the recto-uterine pouch, or *cul-de-sac* of Douglas. In this pouch it covers the utero-sacral ligaments, forming the para-uterine pouches. The lower and outer portions of these latter pouches are called the retro-ovarian shelves. The ovaries project into these pouches, and we can easily see the *ureters* lying just under its thin membrane. Except in distended conditions of the rectum or uterus, we find some coils of small intestine lying in these cavities. When the peritoneum reaches the fundus uteri, it passes forward and downward over the anterior surface of the uterus as far as a point opposite the internal os. It is here reflected over to the posterior wall of the bladder. Passing up over the bladder it is again reflected from its anterior surface at a point opposite the upper border of the pubic symphysis to the anterior abdominal wall. This reflection gives rise to the so-called vesico-abdominal pouch in the same way that the utero-vesical reflection forms the vesico-uterine pouch. The space bounded by the anterior surface of the bladder, the posterior surface of the pubic symphysis, the peritoneal reflection itself, and the abdominal wall is called the space of Retzius. In the utero-vesical pouch, except in distended conditions of the bladder, we find some loops of small intestine. We also have here the round and utero-vesical ligaments covered with the peritoneum. From the sides of the uterus the peritoneum is carried to the lateral wall of the pelvis, completely covering the Fallopian tubes in such a way as to form a mesosalpinx. The ovarian ligament, the anterior and upper surface of the ovary, and the infundibulo-pelvic ligament are also covered by this serous membrane.

### PELVIC CONNECTIVE TISSUE.

The pelvic connective tissue lying just under the peritoneum is found in deposits of various sizes all through the pelvic cavity.

Just posterior to the pubic symphysis we find quite a large quantity of this tissue lying between the bladder and this bony process. At the summit of the bladder there is comparatively nothing of this kind. Beneath the utero-vesical pouch we find a considerable amount, but it disappears at the base of the bladder. Most of this pelvic connective tissue is found about the cervix uteri at the base of the broad ligaments, from which structure it passes downward and mingles with the fibres of the levator-ani muscle, and outward under the broad ligament, furnishing a means of support to the nerves, vessels, and lymphatics in that structure. Continuing on to the pubic wall, it mingles with tissue of the same character on the postero-lateral and posterior walls of the pelvis and that found in the iliac fossa. Between the uterus and peritoneum we find very small amounts of connective tissue. This same rule applies equally well to the utero-sacral ligaments and the peritoneum covering the rectum.

### PELVIC FASCIA.

The pelvic fascia is a continuation downward and inward of the iliac fascia. It is attached laterally to the iliac part of the ilio-pectineal line, to the ischiatic spine behind and the lower part of the pubic symphysis in front, and to the tendinous band connecting these two latter points, which is called, from its color, the "white line" of the pelvis. Behind the ischiatic spine this fascia is continued backward, covering the pyriformis muscle. In the anterior part of the pelvis it leaves an opening for the obturator canal and covers the obturator-internus muscle. This portion is called the obturator fascia. At the tendinous arch, or "white line," the pelvic fascia splits into the recto-vesical fascia, covering the upper surface of the levator-ani muscle, and the obturator fascia, covering the obturator muscles. At a point just below the insertion of the levator-ani muscle this fascia gives off another investment called the anal fascia. Together with that part of the obturator fascia situated below the "white line," it forms the lining of the ischio-rectal fossa. The vesico-rectal fascia arising from the "white line" passes downward and inward and unites with its fellow of the opposite side, forming a diaphragm that is perforated by the vagina and rectum, to each of which structure it sends prolongations of a sheath-like character. The bonds of union between this fascia and the above structures are very strong. The bladder derives all four of its *true* ligaments from this fascia. A side-to-side motion of the rectum is prevented by a few special fascial bands given off near the ischiatic spine.

### PELVIC DIAPHRAGM.

If we dissect away this pelvic fascia we come upon the so-called pelvic diaphragm. This is a muscular expansion composed of the levator-ani and coccygeus muscles. The vagina and rectum perforate it anteriorly. These structures have a double loop from this special diaphragm. The diaphragm itself is attached to the side-walls of the pelvis.

The levator-ani muscle arises from the posterior aspect of the pubes and the ischiatic spine and the "white line" connecting these points. It passes downward and inward and meets its fellow of the opposite side, in addition to attaching itself to the sides of the vagina and rectum. It is also attached posteriorly to the tip of the coccyx. The vagina and rectum are completely surrounded by this muscle. The coccygeus muscle arises from the ischiatic spine and the lesser sacro-sciatic ligament. It is inserted into the last two sacral vertebræ and the side of the coccyx.

Beneath this muscular diaphragm we find a thin layer of fascia, which is attached on each side to the obturator fascia.

### PERINEAL REGION.

Passing now farther out of the pelvis, having discussed the pelvic diaphragm, we come to the perineal region. This region of the body is rather quadrilateral in shape. It comprises all of the tissues lying between the skin, the pelvic diaphragm, and the following boundary-lines: pubic symphysis, descending ramus of the pubes, ascending ramus of the ischium, tuberosity of the ischium, the lower edge of the gluteus-maximus muscle, and tip of the coccyx.

By drawing an imaginary line through the ischial tuberosities, we may divide the whole space into two parts: an anterior, or urogenital, and posterior, or anal, region.

*Uro-genital Region.*—In the anterior region we find the skin, with its underlying adipose tissue. This tissue is continuous with the tissue of the same character in the neighboring parts. Dissecting off this fatty layer, we come upon the superficial perineal fascia, which is attached to the rami of the pubes and ischium. Behind, it turns around the transversus-perinei muscle and becomes intimately mingled with the deep perineal fascia. It is connected to a slight extent with the obturator at a point near the ischial tuberosity.

*Deep Perineal Fascia.*—The deep perineal fascia is made up of two layers: *superficial* and *deep*. It is commonly known under the name of the triangular ligament. The *superficial* layer of this deep perineal fascia is attached to the pubic and ischial rami, and in front to a transverse pelvic ligament lying just under the subpubic ligament of the symphysis pubis. Posteriorly we find this same fascia closely intermingled with the true superficial perineal fascia and the deep layer of deep perineal fascia. The *deep* layer is likewise attached to the rami of the pubes and ischium. It covers the anterior part of the lower surface of the levator-ani muscle and mingles with the obturator fascia. Behind, it covers the levator-ani muscle, and is known as the *anal fascia.* It is perforated by the vagina and rectum.

*Anal Region.*—In the *anal* region we do not find special layers of perineal fascia. The anus lies in the middle of the sulcus midway between the nates. The whole region is covered with skin and a fairly large amount of underlying adipose tissue. A number of hairs and sebaceous glands are also in evidence here.

*Ischio-rectal Fossa.*—Between the ischium and rectum we find a triangular space called the ischio-rectal fossa. It is bounded as follows: *above* by the ischial spine; *internally* by the levator-ani muscle covered by the anal fascia; *externally* by the obturator-internus muscle covered by the obturator fascia; *below* by the great sacro-sciatic ligament, the lower edge of the gluteus-maximus muscle, the sphincter ani, and transversus-perinei muscles. The fossæ communicate with one another by means of the adipose tissue lying behind the pelvic fascia and the rectum. They are limited anteriorly by the line of junction between the superficial and deep layers of the perineal fascia. These fossæ are filled with adipose connective tissue, along with blood-vessels, nerves, and lymphatics.

*Muscles of the Perineal Region.*—Between the layers of perineal fascia we find muscles, nerves, blood-vessels, and lymphatics. The muscles found in the uro-genital region are the bulbo-cavernosus, erector clitoridis, and the superficial transversus perinei.

The bulbo-cavernosus muscle arises from the substance of the perineal body on each side of the vagina; encircles the vagina, bulbs, and vestibule, with the aid of its fellow-muscle; and divides into three slips. One slip is inserted into the posterior surface of the bulb, another into the inferior surface of the corpus cavernosus of the clitoris, and a third slip into the vestibular mucous membrane. This muscle compresses the bulbs of the vestibule.

The superficial transversus-perinei muscle arises from the ischial tuberosity, and is inserted into the tissue of the perineal body. . The erector-clitoridis muscle arises from the anterior surface of the ischial tuberosity and is inserted into the inferior surface of the crus clitoridis. All of the above muscles are supplied by branches of the internal pudic artery and branches of the pudic nerve.

*Deep Muscles of Perineal Region.*—The deeper muscles of the perineal region found in the uro-genital portion of the same are the constrictor urethræ, constrictor vaginæ, and deep transversus perinei.

The constrictor urethræ arises from the deep layer of perineal fascia and the pubic and ischiatic rami, and joins with its fellow of the opposite side in forming a true sphincter for the urethra.

The constrictor-vaginæ muscle arises from the deep transverse perineal septum, lying between the ischial tuberosities, joins its opposite fellow, and forms a sphincter for the vagina.

The deep transversus-perinei muscle arises from the ischial ramus and joins its fellow at the side of the vagina. Some anatomists consider this last muscle to be the posterior portion of the constrictor-vaginæ muscle. These muscles are all supplied by branches of the pudic nerve.

*Perineal Body.*—The perineal body is a mass of muscular, fibrous, and adipose tissue, somewhat pyramidal in contour, and lies between the lower extremities of the vagina and rectum. It measures in most women $1\,^1/_2 \times 1\,^1/_2 \times {}^3/_4$ inches antero-posteriorly. Its base is covered with skin. We find the following tissues entering into its composition: Skin, adipose tissue, anal fascia, posterior part of superficial and deep perineal fasciæ, external and internal sphincter-ani muscles, the levator-ani and transversus-perinei muscles, and the posterior extremities of the bulbo-cavernosi muscles.

It is limited by the skin below, in front by the mucous membrane of the vulva and vagina, laterally by the ischiatic tuberosities, and posteriorly by the rectum. This body—being the meeting-point of all the fasciæ, vessels, and ligaments of the pelvic floor—is, in reality, the *chief support* of the pelvic floor.

The *arteries* in this region are the internal pudic and its branches, the superficial and deep external pudic. The *veins* lead into the internal-pudic and internal-saphenous veins. The *lymphatics* enter the inguinal glands.

This region is supplied by nerves from the pudic nerve and the inferior pudendal branch of the small sciatic nerve.

### (*b*) EMBRYOLOGY.

*Development of the Graafian Follicle and Ovum.* — In the embryo the Wolffian body is covered with rounded epithelium, which a little later becomes thickened on one side, along with a constant and uniform growth of the connective-tissue filaments. This connective tissue is developed from the interstitial tissue of the Wolffian body. It is rich in cells, blood-vessels, and lymphatics. The above epithelial cells go to form the Graafian follicles and the ovary, while the interstitial tissue enters into the formation of the ovarian stroma. In due course of time these cells, both epithelial and connective tissue, multiply so rapidly that numerous trabeculæ are formed, in the meshes of which we find the included epithelial cells. Some of these cells are larger than others. The larger cells constitute the *primordial ova.* These ova are found each in its own net-work of connective tissue. It is extremely rare that we find more than one ovum or Graafian follicle in a single space of this net-work.

As the follicle continues to grow, we can see other changes taking place. The outer layer of cells undergoes a form of hyperplasia in which a distinct envelope is formed. This outer shell is named the *theca folliculi.* It is made up of two layers: an inner layer called the *tunica propria,* and an outer layer, the *tunica fibrosa.* These tunics are composed of fibrillated connective tissue, that is fairly rich in cells, and a basement membrane. The coats, or tunics, are separated from one another by a thin layer of serous fluid.

Each ovum is at first surrounded by a single layer of epithelial cells, but eventually a number of layers become superimposed. Some of these heaped-up cells evidently undergo some process of degeneration, for we soon see a small opening formed—more or less crescentic in contour—in which a clear limpid liquid is left to take the place of the broken-down cells. At a point more especially near the ovum the epithelial cells are piled up in a mass called the *discus proligerus.* The layer of cells that forms the confining boundary to the follicular fluid is called the *membrana granulosa.*

It is said that about 30,000 Graafian follicles in various stages of development are found in each ovary at birth. Some of these structures never even develop during the extra-uterine life of the individual to whom they chance to belong. The liquefied follicular fluid manages to diffuse itself in such a way that the ovum can learn to rely upon it for nourishment during the first few days after impregnation has taken place.

A mature ovum is generally about $^{1}/_{120}$ inch in diameter. It is cylindrical in outline and surrounded by a membrane called the vitelline membrane, or *zona pellucida*, from its peculiar way of transmitting rays of light. This membrane is made up of a layer of rather long epithelial cells, with fairly-large nuclei and sufficient basement membrane to act as a support and means of nourishment to these same nuclei. The ovum and its surrounding membrane are two separate structures. There is a clear, narrow space between the vitellus, or yelk, and the vitelline membrane, or *zona pellucida*. It is in this space that the yelk is allowed to rotate on its axis and undergo various amœboid movements. The body of the cell which constitutes the primordial ovum now becomes the vitellus, or yelk proper. The primitive cell-matter goes to form the original protoplasm of the ovum. From it we have developed the cells that are to act as the basis of embryonic development. This primitive cell manufactures highly-refractive particles called by the name of deutoplasm. This substance is found most prominent in the centre of the ovum, while external to it, and surrounding it, we have a clear substance in which the germinative vesicle lies. Within this vesicle is developed the germinative spot. Its real origin is, in all probability, the nucleolus of the original ovum.

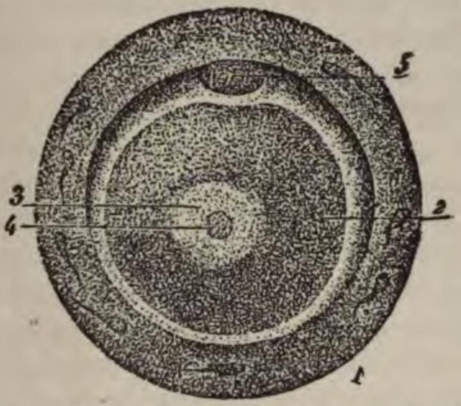


Fig. 10.—Formation of the polar globule. 1, zona pellucida, containing spermatozoa; 2, yelk; 3 and 4, germinal vesicle; 5, the polar globule.

*Rupture of the Graafian Follicle at Menstrual Epoch.*—As we have seen thus far only the complete formation of the Graafian follicle and its surrounding membrane, we will now consider what further purpose it fulfills in the female body. It must be borne in mind that a great majority of the many thousands of Graafian follicles never mature—even after menstruation has become fully established. As regards those that do mature, we can readily follow them through their different movements, transformations, etc.

When the human female arrives at her first menstrual period, on removing one of the ovaries we would find its surface studded with a number of bead-like processes looking more or less like the small rice-bodies in some of the degenerations of the skin. These small processes are nothing but the matured Graafian follicles. The cell-proliferation and the marked increase in fluid resulting from the degeneration of some of the cell-elements have been so complete that some of these follicles are well-nigh the point of bursting. When the swollen follicles do reach the surface of the ovary, they rupture and allow the *vitellus*, or yelk proper, to escape, leaving behind its surrounding membrana granulosa and tunics: the *tunica fibrosa* and *tunica propria.* These structures help to form the corpus luteum, or cicatrix, resulting at the point of rupture. Numerous blood-vessel arches and heaps of cells are at once formed in the open space. They are to help in filling in the chasm left by the rupturing follicle. The increase in size and number of the cells is so great that some of the cells, along with the blood-vessels, degenerate. This so-called necrosed tissue is cast off. The remaining cells and connective tissue developed from the surrounding tissues are massed together into a mass of organized tissue, which forms the cicatrix complete in every way.

If the ovum is discharged unimpregnated the corpus luteum, or cicatrix, is fully formed at the end of three or four weeks. At the end of seven weeks we can find nothing but a small white scar on the surface of the ovary.

On the other hand, should impregnation ensue, the cicatrix does *not* reach its maximum size until five or six months have elapsed. It remains of a bright color until nine months have elapsed, when a scar the size of a three-cent piece is left to mark the site of rupture of the impregnated ovum. This latter cicatrix is called a *true* corpus luteum, while one of the former class is known as a false corpus luteum.

*Migration of the Ovum.*—As to the course pursued by the escaped ovum, we are more or less in the dark. We already know that the Fallopian tubes are attached to the ovaries by one or more fimbriated extremities, and that those processes possess more or less motion. Just what method they adopt for grasping the escaping ovum is conjecture to a great extent. Some say that the fimbriæ have a peculiar muscular action by means of which they grasp the ovary and completely cover the point of follicular rupture. Other authorities say that they have a peculiar form of erectile tissue that gives them the power of settling down over the seat of rupture and allowing the escaping ovum to pass directly into the tube. The most commonly accepted view is that the ciliated epithelia lining the fimbriæ suck the ovum directly into the tube by its peculiar wave-like action and carry it along to the uterine cavity. That this is true, in all probability, is shown by the fact of impregnation's following the removal of a tube and ovary on opposite sides of the uterus.

*Changes Taking Place in the Ovum Following Fecundation.*—When the ovum has arrived at the stage of maturity, we find the process signalized by the production of the polar globules. These globules are two in number. They spring from the opposite extremities of the germinative vesicle, which, just previous to this change, assumes a more or less radiate form. After these globules have been extruded, we find the remaining part of the vesicle, along with its nucleolus, receding from the surface of the ovum and becoming known as the *female pronucleus.*

When a spermatozoön pierces or enters the investing membrane of the ovum it unites with the female pronucleus (itself being called the *male pronucleus*), and forms the segmentation-nucleus of the fecundated ovum, or, in other words, the *oösperm.* This segmentation-nucleus now subdivides into two nuclei, and the vitellus, or yelk, into two parts as well. The nuclei have grouped about them the various component parts of the protoplasm of the vitellus. We have, therefore, as a result of this cleavage-process in the fecundated ovum, a complete division into two cells. The *larger* cell and its derivatives are known as the epiblastic spheres. The *smaller* cell and its derivatives are known as the hypoblastic spheres. This subdivision is carried on still farther until the ovum has been divided many times. As a result, it has the appearance of a mulberry and is called a *morula*. When this cleavage-process is entirely finished, we find the epiblastic spheres arranging themselves about the circumference of the ovum and lining the inner surface of the

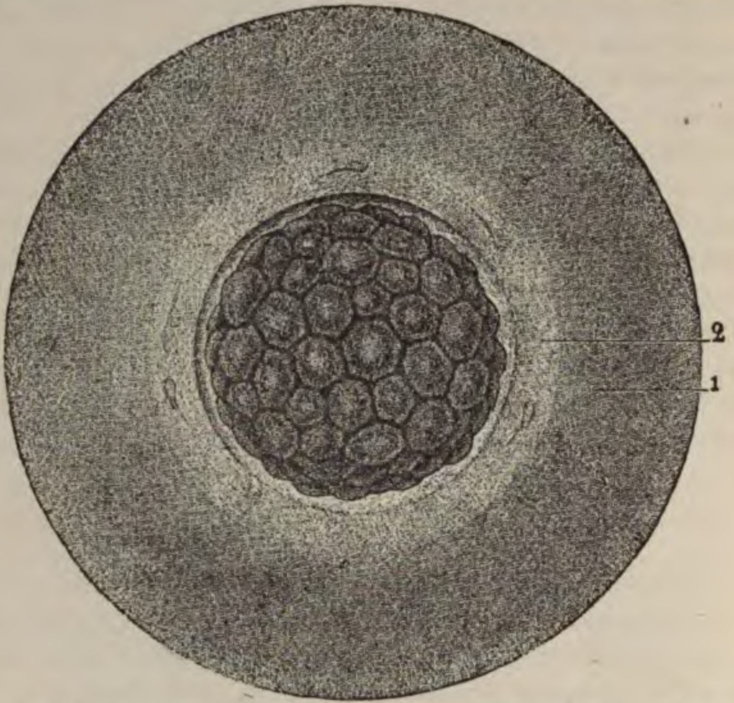


Fig. 11.—Formation of the blastodermic membrane from the cells of the muriform body. 1, layer of albuminous material surrounding; 2, the zona pellucida. (After Joulin.)

zona pellucida, except at one point called the blastophore. Within these cells we find the hypoblastic spheres arranging themselves in a circular manner and completely covering the epiblastic spheres. The epiblastic cells are clear in character and cuboidal in shape. The hypoblastic cells are irregularly polyhedral and coarsely granular in appearance. Soon after the first epiblastic cells are formed, we find the blastophore covered by them, and a separation taking place between these two layers of cells: *i.e.*, epiblastic and hypoblastic layers. This separation is complete except at the point where the original blastophore was in evidence. The morula, or segmented ovum, becomes now so distended with fluid that its epiblastic and hypoblastic cells are pressed to the circumference of the ovum. Through this increase of fluid the mulberry-shaped mass begins to look like—and, in fact, does become—a *true blastodermic vesicle.* The central part of the coalescing area between the epiblastic and hypoblastic cells becomes thickened and forms the starting-point of the *embryonic area.* This area is made up of three layers: an *outer*, or epiblastic, layer, and two *inner* layers called the hypoblast. It is from the hypoblastic layers that the future embryo is entirely developed. The epiblastic cells beyond the embryonic area help only to form the amnion. The outer layer of the hypoblast now becomes the *epiblast* proper, and the inner layer the *hypoblast.* Between these two layers we find a third and middle layer developing, called the *mesoblast.* Its cells line the whole of the inner side of those of the epiblast in the same manner as those of the hypoblast.

From the epiblast we have developed the epidermis, hair, nails, epithelium of the mouth, nose and cloaca, the glandular structures of the skin, brain, spinal cord, and organs of special sense. From the mesoblast we have derived the bones, muscles, corium of the skin, connective tissues, muscles of the intestinal tract, blood and blood-vessels, and genito-urinary system.

From the hypoblast we get the epithelium of lungs and air-passages, lining membrane of the intestinal glands, and the intestines themselves.

After the formation of the embryonic area the first change that we can observe as taking place is the formation and appearance of the primitive *dark streak*, which is, in all probability, the result of a thickening of the mesoblastic cells. This thickening process is carried so far that the so-called primitive groove is formed, and the ovum itself begins to take on an ovoid—rather than that of a rounded—appearance. In front of the primitive tract two ridges are formed by a thickening of the epiblast. They are called the *medullary folds*, which include between them the *medullary furrow*. These folds at first diverge behind, but they finally converge enough to include the first portion of the primitive streak.

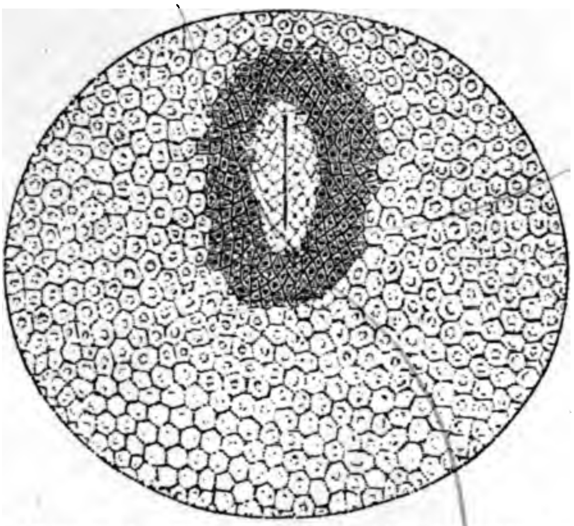


Fig. 12.—Diagram of area germinativa, showing the primitive trace and area pellucida.

A transverse section of the embryo at this time would show all these layers of cells united at the median line. The mesoblast is the thickest of the three layers. It has also a more stratified appearance. We can see quite easily the medullary groove in the upper part of the section, with the dorsal plates bearing close resemblance to low ridges. Beneath this furrow, or groove, we find a cell-mass called the *chorda dorsalis.* The future vertebræ arrange themselves about this mass, being themselves derived from that portion of the mesoblast on either side of the chorda dorsalis. The peripheral portions are called the abdominal plates. The medullary folds, of course, continue to grow, and finally meet in the median line so as to form a tube that is closed in character and in which the development of the central nervous system goes on to maturity. The stratified layers of the mesoblast now coalesce into two layers, and remain united at their inner borders, forming thereby the mesenteric folds. The intestine is formed by the outer ends of the innermost layers of these two strata developing so far as to meet in front and at the same time inclosing the hypoblast layer of cells that goes to form the lining as well as the glandular structures of this organ. It is extremely easy to see just how the mesoblast enters solely into the formation of the muscular wall of the intestine. There is a small portion of the blastodermic vesicle, however, that does not become included in the intestinal tube. It is the umbilical vesicle that hangs from the body of the embryo during the early months of gestation. The epiblast and the outer stratum of the hypoblast now grow forward in such a manner that they form a long cavity inclosing the intestine. This is subsequently divided into two parts by the diaphragm, forming the abdominal and thoracic cavities.

If we take now a more comprehensive view of the embryo, we find it becoming more and more a distinct and separate part of the germinative area. The back becomes arched and convex and the extremities begin to approximate one another. The anterior or cephalic portion of the embryo is much larger and thicker than the podalic extremity.

*Formation of Amnion.*—As more and more fluid is secreted between the outer and inner layers of the mesoblast, the outer layer unites with the primitive epiblast and forms a membrane which, when united with similar processes springing from the back and sides of the embryo, finally meet over the dorsum and make a complete sac. This sac is called the amnion, and is filled with fluid that, in the early months of fœtal life, is, in all probability, secreted by the fœtal tissues. Later on it comes from the capillary net-work that lies immediately under the amnion in that portion of the chorion that covers the placenta. The continued increase of fluid during the latter months of gestation is, in all probability, due to the excretion of urine from the fœtus. There is generally from one to two pints of amniotic fluid in the mature amniotic sac. Fully one-half of this is secreted during the last three months of pregnancy. The fluid shows, on careful examination, the presence of albumin, urea, and a number of saline substances.

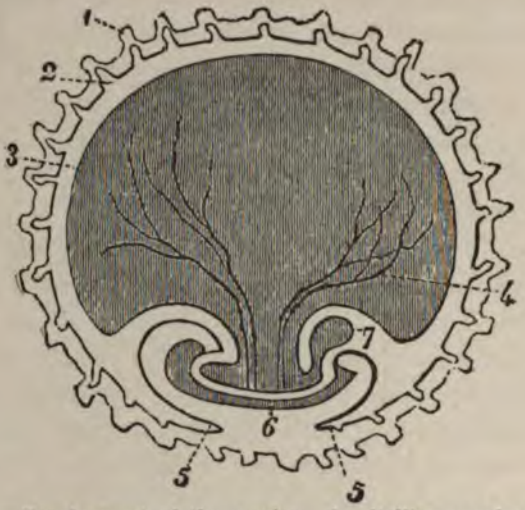


Fig. 13.—Development of the amnion. 1, vitelline membrane; 2, external layer of blastodermic membrane; 3, internal layers forming the umbilical vesicle; 4, umbilical vessels; 5, projections forming amnion; 6, embryo; 7, allantois.

*Formation of Umbilical Vesicle.*—As regards the means of nourishment of the embryo, we have to consider, first, the umbilical vesicle. It is this structure that nourishes the fœtus entirely from the time it leaves the Fallopian tube until a new structure, the allantois, is formed. We have already seen that it is a tube hanging down in the abdominal cavity and lined with hypoblastic cells and cells from the *inner* stratum of the mesoblast. Its cavity communicates with the intestine, and intestinal blood-vessels course over it, thereby furnishing it with nourishment for the use of the embryo. This process of feeding continues for only a few days, because these same blood-vessels soon atrophy, and the vesicle, as a result, atrophies also, hanging by an impervious pedicle to the intestine. It is by means of the *placenta* that the *ovum* is to derive its chief nourishment after it reaches the uterine cavity. This is an organ through whose walls a complete interchange of the maternal and fœtal blood is constantly going on during intra-uterine life. To study this special structure we have first to consider the different organs entering into its formation. These are the chorion, the allantois, deciduæ, and finally the placenta itself.

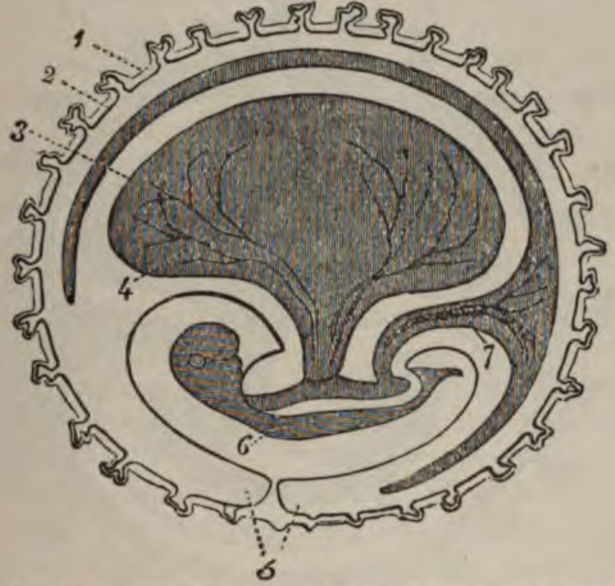


Fig. 14.—1, exo-chorion; 2, external layer of blastodermic membrane; 3, umbilical vesicle; 4, its vessels; 5, amnion; 6, embryo; 7, allantois increasing in size.

*Formation of the Chorion.*—The chorion is at first only the vitelline membrane, or zona pellucida. It is, as we know, the investing membrane of the ovum itself. As the impregnated ovum, having, as we suppose, encountered the spermatozoön in the Fallopian tube, slips into the uterine cavity, a large number of shapeless villi are thrown out from the surface of the vitelline membrane, which villi help to retain it in its proper position in the uterine cavity. By the continual expansion of the outer layer of the amnion, which is at first attached at a point where the folds meet over the embryo's back, we have a coalescence of this amniotic layer with the zona pellucida, which it reaches in a very short space of time. The product of this union is called the *new chorion*. It becomes very rapidly covered with a number of hollow villi of all sizes and shapes. By the end of the third week of intra-uterine life these villous processes are completely formed.

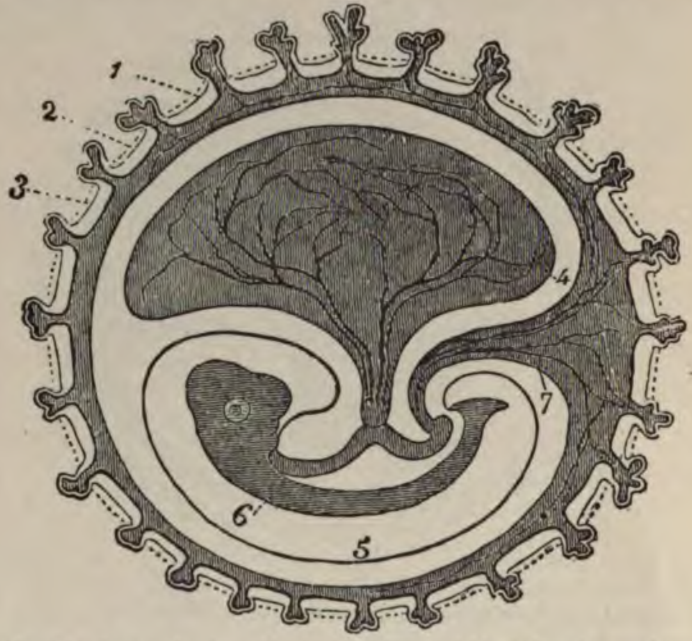


Fig. 15.—1, exo-chorion; 2, external layer of blastodermic membrane; 3, allantois; 4, umbilical vesicle; 5, amnion; 6, embryo; 7, pedicle of allantois.

*Formation of the Allantois.*—Turning now to the allantois, we find it at first as a sac-like process projecting from the posterior extremity of the intestine. It begins to grow when the umbilical vesicle is still quite large and while the amniotic folds are rising up about the embryo. It is lined with the *hypoblastic* cells and the *inner* layer of mesoblast cells. Its structure is highly vascular, and its inner walls soon coalesce to such an extent as to form only one membrane. By continual growth, the allantois spreads so far as to completely cover the *inner* surface of the chorion, and we then have a line of fusion taking place between these two structures, with the resulting formation of the *true chorion.* The blood-vessels of the allantois pierce all parts of the chorionic villi. At first we find the embryo connected with the vascular chorion by two arteries and two veins, but one of these veins eventually atrophies, and we have left the two arteries and one vein of the umbilical cord.

*Formation of the Placenta.*—As the ovum continues to grow, we have a diminution in the vascular structures covering its surface, except at the point of attachment of the allantoic vessels. We then see that instead of the whole surface of the chorion being covered with vascular villi, we have only about one-third of it in that condition. This latter point becomes more and more vascular, and, as we shall soon see, it enters into the formation of the true placenta.

The deciduæ are formed as follows: When the impregnated ovum drops from the Fallopian tube into the uterine cavity, it finds there a highly-swollen condition of the mucous membrane. The interglandular spaces, together with their cells, have undergone much hypertrophy and hyperplasia. The whole lining of the uterus is thrown into convolutions. This new mucous membrane is called the *decidua vera.* The ovum soon sinks into one of the depressions of the swollen mucous membrane and begins to form a line of attachment. This line of attachment is called the *decidua serotina.* The continual and constant swelling and enlargement of the various structures entering into the formation of the uterine mucous membrane soon allows it to completely cover the embryo, forming the *decidua reflexa.* Between this latter new membrane and that lining the cavity of the uterus, we have a small quantity of viscid mucus.

The placenta is divided into two parts: fœtal and maternal. The fœtal portion is formed as follows: When the decidua reflexa is first formed, the vessels projecting from all the chorionic villi dip down between the swollen folds of its mucous membrane and carry nourishment direct from the maternal circulation. But this process soon ceases over the greater part of the surface of this special form of reflexa. In the first place, its walls begin to thin out except at

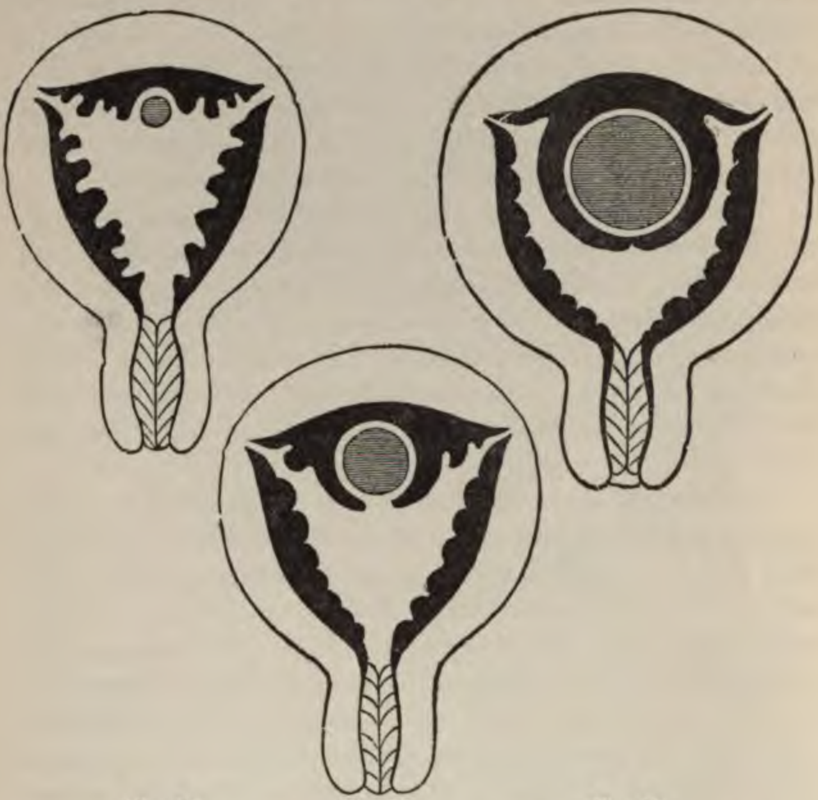


Fig. 16. Fig. 17. Fig. 18.

Fig. 16.—Formation of decidua. (The decidua is colored black, the ovum is represented as engaged between two projecting folds of membrane.)

Fig. 17.—Projecting folds of membrane growing up around the ovum.

Fig. 18.—Showing ovum completely surrounded by the decidua reflexa.

(After Dalton.)

that part in which we find the decidua serotina. When the true chorion is formed, we find also an atrophy taking place in the villi except at a point opposite the decidua serotina. At this point we find an increase in the size and number of the blood-vessels and the interglandular substance of the decidua. The villi also increase and send out many offshoots, giving the whole area an appearance not unlike that seen in the arrangement of a tree and its branches. The villi become tufted, and the whole spongy mass becomes known as the *fœtal portion* of the *placenta.*

On the maternal side we find projections coming from the soft and pulpy interglandular spaces in such a manner and to such an extent as to completely encircle the villous tufts and their branches. This increased growth of fœtal and maternal tissue goes on until the end of the fourth month, when we find a very complete change taking place. The fœtal villi retain their size and shape, but the maternal tissues begin to thin out, so that at full term we find only a thin layer of mucous membrane covering the placenta. It dips down between the villous tufts as far as the chorion. Some of these tufts are attached directly to the decidua serotina. Others float free in the blood-current of the mother.

The mature placenta measures from 6 to 8 inches in length and weighs about 16 ounces. It is from $^3/_4$ to 1 $^1/_4$ inches in thickness. It is covered on its fœtal surface by the amnion. Many vessels are in view under this thin, smooth membrane previous to dipping down into the villous tufts. The thin membrane on its maternal surface is, as we have seen, the product of the decidua serotina. Tortuous *arteries* pass from the mucous membrane of the uterus to the interspaces of the villous tufts, at which places only a thin layer of cells separates the fœtal and maternal bloods. The *venous* blood is carried back to the uterus by means of the coronary vein on the periphery of the placenta and the various venous sinuses formed between the villous tufts.

*Formation of the Umbilical Cord.*—When we first found the allantois as a sac-like process projecting from the intestine, the fœtus itself was very small in comparison with the umbilical vesicle. This vesicle, by its large size, diverts the allantois over the posterior surface of the fœtus in such a manner that the allantois comes in contact with the chorion and forms a pedicle of attachment. By this junction we have a means of circulation established between the embryo and the periphery of the ovum. It is the above pedicle of attachment that forms the future mature *umbilical cord.* The vessels in this pedicle are all obliterated with the exception of two umbilical arteries and one umbilical vein. The umbilical vesicle, as we said before, now shrinks to a mere thread. The amnion now fills with fluid coming from the body of the fœtus, and brings itself in contact with the chorion in such a way that it completely surrounds the allantoic pedicle.

Wharton's jelly, or gelatin, more properly speaking, is now formed. It is made up of connective-tissue spaces filled with amorphous matter. This substance lies within its investing membrane and in contact with all parts of the blood-vessels in the umbilical cord. It acts as a buffer for these structures. A cross-section of the cord would now show two umbilical arteries, one umbilical vein, amniotic sheath, Wharton's gelatin, and traces of the umbilical vesicle and pedicle of the allantois.

The umbilical cord is of various length in different women. Generally it is from 10 to 20 inches in length. In thickness it is from $^1/_4$ to $^1/_2$ inch. The arteries, whose walls are not much thicker than those of the vein, encircle the vein in a spiral manner. Both sets of vessels have semilunar valves.

*Fœtal Circulation.*—The course of the circulation of the blood to the fœtus is as follows: In the first place, the fresh maternal blood, entering the fœtus at the umbilicus by means of the umbilical vein, passes through that vessel to the liver. Here it gives off several branches to the left lobe, the quadrate and Spigelian lobes. At the transverse fissure the vein divides into two branches, the larger of which empties directly into the vena porta and the smaller into the ductus venosus, which, in turn, very shortly enters the inferior vena cava. There is even at the beginning a marked disproportion in size as regards these two branches of the umbilical vein.

As the age of the fœtus advances, this difference in size becomes more and more apparent, so that toward the termination of gestation we have nearly all the blood entering the portal vein. We therefore have the inferior vena cava carrying blood to the heart from three sources. Some of the fluid is charged with carbonic-acid gas, collected from the tissues of the lower extremities. Most of it is from the liver, and a small portion from the umbilical vein, having traversed the ductus venosus. In the early months of ges-

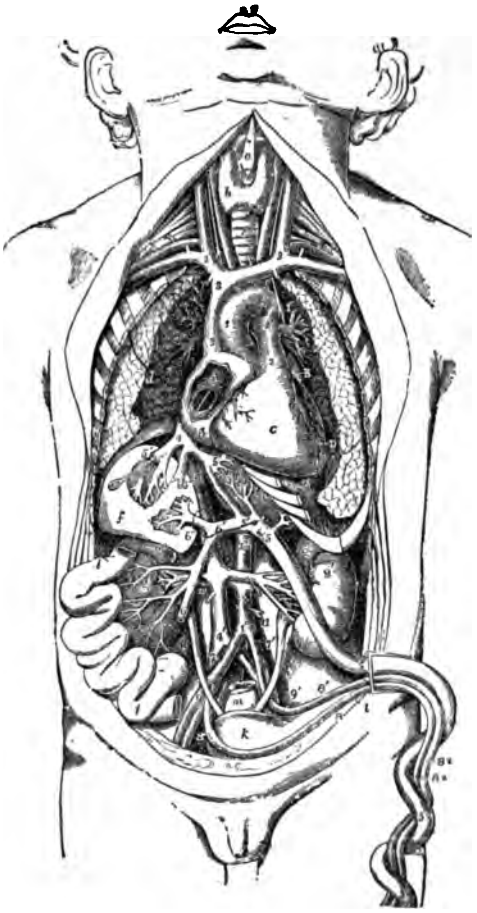


Fig. 10.—The fœtal circulation.

tation the blood reaching the heart by the inferior vena cava enters at once into the right auricle. Here, instead of passing on into the right ventricle as it always does in an adult, the greater part is reflected by the Eustachian valve into the left auricle through an aperture existing between the right and left auricles, called the *foramen ovale.* The left auricle forces it into the left ventricle, and this cavity, in turn, sends it on into the aorta. When the impure blood from the upper extremities comes back to the right auricle of the heart through the superior vena cava, it passes in front of the Eustachian valve into the *right* ventricle. The mixing of the blood from the superior and inferior venæ cavæ in this right auricle is almost entirely prevented by the presence of the Eustachian valve. As the gestation advances, we have a gradually-increasing amount of blood from the inferior vena cava passing into the right ventricle and a contraction of the Eustachian valve and foramen ovale. The blood that does enter the right ventricle passes, for the most part, into the ductus arteriosus and from that vessel into the aorta. A small quantity enters the pulmonary artery. We thus see, during at least the first half of gestation, the upper extremities receiving the major portion of the fresh oxygenated blood from the maternal vessels and thereby developing at the expense of the lower extremities. Later on, as more and more arterial blood enters the aorta through the right auricle, right ventricle, and ductus arteriosus, this becomes fully developed also. After respiration in the newborn child has been completely established, we find the closing of the ductus arteriosus and obliteration of all the umbilical vessels, with the exception of the lower ends of the umbilical arteries, which now become known as the vesical arteries. These arteries, at the beginning, originate from the inferior vertebral arteries and later on, as in the adult, from the internal iliac arteries. Along with the closure of the ductus arteriosus we find the foramen ovale also closing with the filling of the left auricle with blood. The Eustachian valve, of course, also disappears, and we have the venous blood from the whole body passing from the right auricle into the right ventricle and from this cavity into the pulmonary artery to traverse the lungs and return by the pulmonary vein to the left auricle. Occasionally we find a patency of the foramen ovale persisting after the birth of the child. When such a condition does exist, we have an affection called *cyanosis neonatorum*, characterized by blueness of surface of the body, attacks of marked dyspnœa, and subnormal temperature.

*Growth of Fœtus in Successive Monthly Stages.*—Having now traced the growth of the fœtal structures in a general way, let us outline the successive changes taking place in them from month to month.

In the *first* month the fœtus is a semitransparent, shapeless mass, in which we cannot discover any regular definite structure. All that we can make out is the surrounding amnion and the pedicle of the umbilical vesicle leading into the abdominal cavity.

In the *second* month the fœtus is about eight lines in length, and weighs one drachm. The extremities are visible in the form of minute projections from the main portion of the body. The head can be easily seen with an eye on either side looking like a black bead fastened to it. The vertebræ are forming, on either side of which structures, arranged in the form of a column, we find large glandular organs called the Wolffian bodies. These structures are destined to fulfill the renal functions until the kidneys are formed. After birth of the full-term child their only remains are found in the parovarium, lying between the layers of the broad ligament. The *heart* is also now in evidence, with only *one auricle* and *one ventricle*, with the pulmonary artery and aorta arising from the latter organ. Centres of ossification are found in the clavicle and inferior maxillary bones. The brachial *arches* of blood-vessels, along with brachial *clefts* supplied by them in the pharyngeal region, are seen early in the second month. During the latter part of the eighth week we see a complete disappearance of the clefts, and the arches unite to form the descending aorta.

In the *third* month the weight of the fœtus has increased to five drachms in most cases. The interventricular septum has formed in the heart, dividing it into two auricles and two ventricles. The forearm, with finger-like processes, have developed. The abdominal cavity has become a closed space, while the allantois and umbilical vesicle have disappeared. The alimentary canal has begun to be formed. The head and eyes are much larger than formerly, and the mouth and nasal cavities are separated from one another.

During the *fourth* month of intra-uterine life the fœtus has increased in weight from five drachms to about six ounces. Its length is about six inches. The head, with its covering *hair*, is constantly growing larger. The inclosed brain begins to show a convoluted appearance. The muscles are developed enough to give some movements to the limbs. The sexual organs can be differentiated, and centres of ossification can be seen in the occipital and frontal bones and the mastoid processes of the temporal bones.

In the *fifth* month the head becomes very large, and makes up from one-quarter to one-third of the whole length of the fœtus. The nails are formed. The fœtus has quite strong movements. Its weight has increased to about nine or ten ounces, and its length to from eight to ten inches.

It is during the *sixth* month that the fœtus weighs a full pound, as it should do in most cases. The pubic bones have begun to ossify. Eyelashes and the pupillary membrane have formed. In females the clitoris is quite prominent. The testicles in the male still lie within the abdominal cavity.

In the course of the *seventh* month the fœtus has gained from two to three pounds in weight. It is from twelve to fifteen inches long. Many of the mature structures of the *skin* are fully formed. The eyelids cover the eyes. Testicles have descended into the scrotum.

In the *eighth* month the fœtus increases in weight to the extent of about one pound over that of the preceding month. There is likewise a slight increase in its longitudinal axis of about one or two inches. It seems to grow more in width. The nails are fully formed and the pupillary membrane of the sixth month has completely disappeared.

At *full term* the fœtus weighs from six to eight pounds, as a rule, and measures about twenty inches in length.

# CHAPTER II.

## DIAGNOSIS, DIFFERENTIAL DIAGNOSIS, DURATION, AND HYGIENE OF PREGNANCY.

The signs or symptoms which lead to the diagnosis of pregnancy may be grouped under the headings of general and local, subjective and objective. Impregnation of the ovum affects the body in general as well as the reproductive organs in particular. The resulting train of general and of local symptoms must be separately studied and the weight of each must be properly appreciated in order to reach a diagnosis which rests on a basis of scientific exactitude.

The systemic and the local alterations will be separately studied, as far as is possible, in the order in which they may be first appreciable.

*I. The Nausea and Vomiting of Pregnancy.*—This sign of pregnancy often precedes the second sign,—amenorrhœa. It is a fairly constant accompaniment of pregnancy, although some women never suffer from it to any degree, whilst in others it is exaggerated to such an extent as to become an actual disease imperiling life. No satisfactory explanation for its occurrence has ever been offered, and we are obliged to rest content with the vague term "neurosis" as descriptive. Very frequently chronic constipation, the result of torpor of the intestinal tract, is at the bottom of the symptom; but then, again, it is a prominent symptom, although the intestinal canal is functionating after a normal fashion. In some women it is excited only by the sight of food or the smell; in others it occurs only in the morning on awakening and disappears on the ingestion of food; in rare instances, by a curious coincidence, the sign fails to appear at all in the woman, but is present in a marked degree in the husband. It is at once apparent that this sign can carry no weight in the estimation of the probable existence of pregnancy, being purely suggestive when associated with other symptoms.

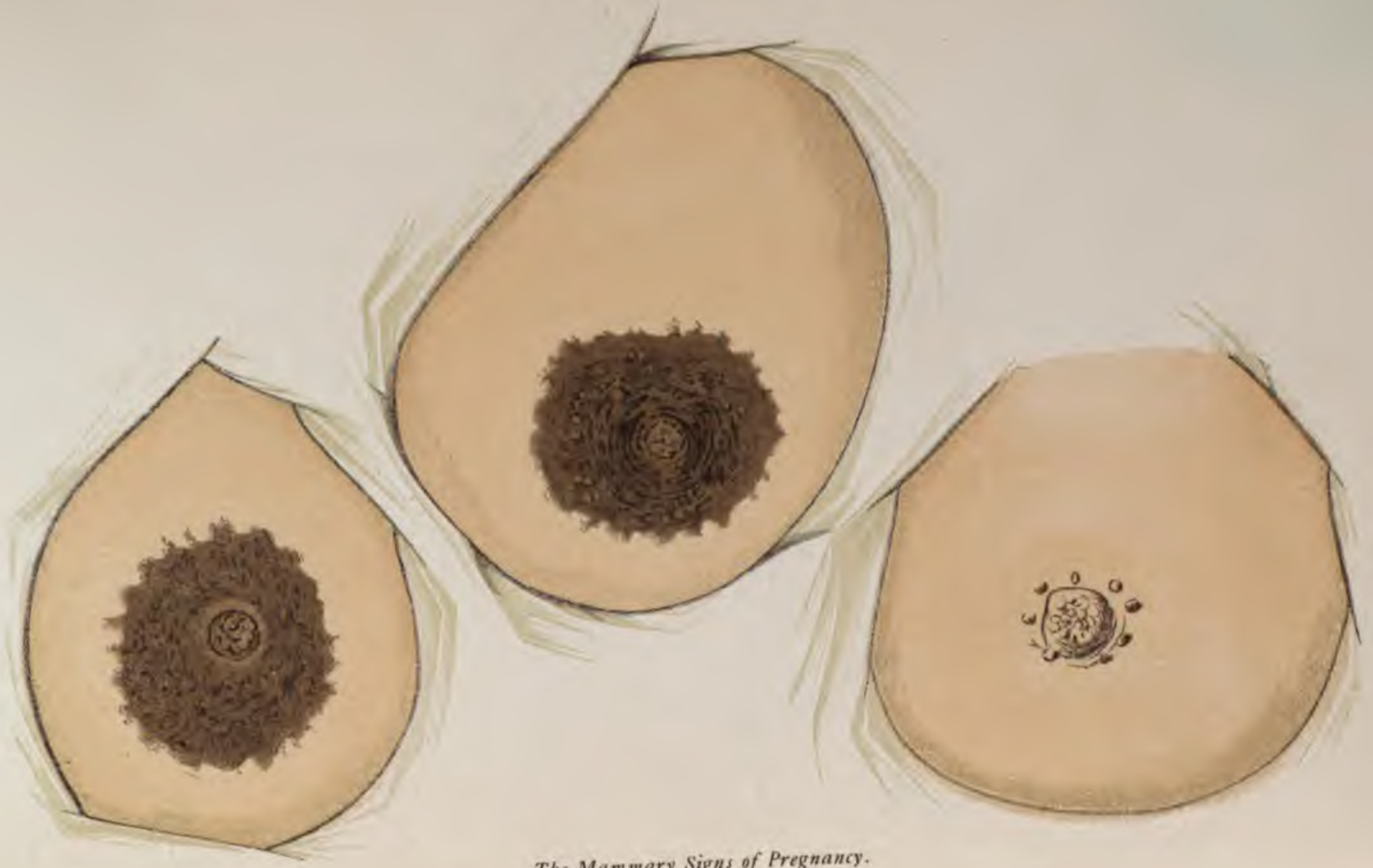
*II. Amenorrhœa.*—As a rule, the function of reproduction in woman is associated with that of menstruation. Therefore, in general, cessation of menstruation is one of the earliest signs of pregnancy. This rule, however, is subject to a number of exceptions. There are some women who never menstruate at all, and yet they conceive with considerable regularity. Witness the case of a woman who conceives during lactation, when usually menstruation is absent; witness, also, the exceedingly rare instances where there has never been present a red discharge, although there occur each month the general symptoms of menstruation,—the so-called *molimina.* Absence of menstruation, therefore, in women of this type may or may not mean the occurrence of conception. Whilst, also, the cessation of menstruation is a usual accompaniment of conception, other causes may arrest the function. Change of climate, mental impressions, exposure to cold, certain diatheses, such as chlorosis, anæmia, or disease of the kidneys or lungs,—are affections which often are associated with absence of or irregular menstruation. Further still, in some women, notwithstanding the occurrence of pregnancy, there exists a periodical red discharge which simulates menstruation. This discharge may be due to the presence of a small cervical polyp or may be a transudation from the surface of an eroded cervix; whatever the cause, it introduces an element of uncertainty in the diagnosis. Suppression of menstruation is, therefore, a sign of little value except in case of women who have been previously regular and in whom the factors mentioned above are absent. Taken alone, this sign carries simply strong presumption. Too great care cannot be exercised not to allow this sign to swerve the judgment of the physician into the expression of a positive opinion; and, at the same time, the presence of this sign should always lead him into being exceedingly circumspect in making any intra-uterine treatment, particularly since absence of menstruation being associated in the lay mind with the presence of pregnancy, a woman who does not desire to bear children will unquestionably endeavor to deceive her physician by giving a false history of regular menstruation.

In connection with this subject of suppression of menstruation it must ever be remembered that the most dangerous affection to which woman is subject, if it be not recognized early,—ectopic gestation,—is associated with irregular hæmorrhages at the stage when, above all others, it is necessary that a correct diagnosis should be made in order that the proper surgical treatment may be instituted.

*III. Quickening.*—Quickening, or the sensation of fœtal motion, is a sign of considerable value when taken in conjunction with others. It is, however, of greater value in enabling us to predict the probable period of gestation than as assisting us in reaching a diagnosis of pregnancy. Many women hardly are conscious of the motion of the fœtus until other very positive signs of pregnancy exist; other women, in their anxiety for children, feel this sign when they are not pregnant, or deceive themselves into the belief that they feel motion long before it is likely they could. The time of the appearance of the first sensation of fœtal movement is rather variable. As a rule, the sixteenth week is the date, although some women are affected earlier and others much later. The sign is described as a "flutter" in the abdomen, and is believed to be due to the first contact of the enlarged uterus with the abdominal wall. The fact that the sign is felt so much earlier by some women and so much later by others would seem to disprove this idea. The preferable explanation is that which looks to the transference by nerve-impulse of the motion of the fœtus. As gestation advances these motions become more and more active, although varying in character in different women. This sign is likely to be simulated by the motion of gas in the intestinal canal, and in women of a highly nervous organization the belief in the existence of pregnancy, although absent, may become firmly established, especially if other supposed symptoms concur, giving rise to the occurrence of that peculiar neurotic condition to which the term "pseudocyesis" has been applied. Sudden cessation of fœtal movements is often coincident with death of the fœtus, although there are scores of cases recorded where healthy children have been born even after motion has not been appreciated for months or never felt. The sensation of motion, therefore, by the woman carries only relative value as a sign of pregnancy. When felt by the physician the case, as will be noted, is different. There is nothing which is likely to simulate the motion of the fœtus to the hand of an expert. Neither contraction of the abdominal muscles, nor the movement of gas in the intestines, nor a wandering kidney,—which, by the way, frequently imposes on the woman,—can yield to the hand of the unprejudiced observer the sensation of the moving fœtus. It must be remembered, however, that there are conditions—such as excess of liquor amnii—which will interfere with the perception of these movements by the physician, and, in excessive cases, by the woman.

*IV. Mammary Signs.*—Changes in the breasts are among the earliest signs of pregnancy. In many women the breasts become painful and enlarge within a fortnight of the occurrence of conception. As a rule, however, the characteristic changes do not occur until a much later date. About the end of the eighth week the nipples swell, become erectile, deepen in color, and their sensibility is increased. Frequently even as early as the twelfth week a drop or so of colostrum may be expressed from the breasts. The sebaceous glands of the nipples increase in size, appearing as papules above the level of the skin. The areola of the nipples takes on a deeper hue, this phenomenon being especially marked in brunettes. About the twentieth week a secondary areola is formed outside of the margin of the primary, this again being especially marked in brunettes. (Plate II, A.) As gestation advances these changes in the breasts become intensified, the surface being traced with bluish vessels and the glands becoming not only larger, but also more painful. These changes may be traced to the intimate sympathy which exists between the genitalia and the mammary glands. Therefore, the breast signs described are, early in pregnancy, only of relative value as a means of diagnosis. In women

PLATE I.



The Mammary Signs of Pregnancy.

of an erotic temperament these same signs are not of uncommon occurrence aside from pregnancy, particularly at the menstrual period, and, again, disease of the uterus or of the ovaries is often associated with the same signs. The mammary signs are, perhaps, of greater value in primiparæ than in multiparæ, certainly at an early stage of pregnancy. The negative value of the signs is, at this date, of greater value than the positive. Absence of the signs entirely is strong presumptive evidence of absence of pregnancy. (Plate I.)

*V. Vaginal Signs.*—Of considerable presumptive value of pregnancy is the bluish discoloration of the vagina, or, rather, of the urethral bulb. This sign is an early one, being appreciable at about the sixth week. It is due not alone to venous congestion, but also to the actual increase in size of the venous radicles which exist in this locality. As pregnancy advances this discoloration increases, in certain instances the color being almost black, when, however, marked varices are present. This discoloration of the urethral bulb may also be noted in connection with other causes of vaginal congestion, such as marked prolapse of the uterus or impacted fibroid growth; but then other symptoms characteristic of pregnancy will be absent. The sign altogether is of considerable presumptive value in connection with other signs, particularly in the nullipara.

*VI. Cervical Signs.*—At a very early date of pregnancy the cervix, on inspection, has a similar bluish tint to that just dwelt upon as present at the urethral bulb. The characteristic change in the cervix, however, which should always suggest the existence of pregnancy, is the so-called softening, which is the natural result of the congestion of the cervical tissues associated with the presence of pregnancy. This softening, it should be noted, is in the substance of the tissues, and not alone at the tip of the organ. Sensation of softening at the tip may be due solely to an erosion of the epithelium; softening in substance is very different and not alone yields a different sensation to the examining finger, but on inspection the cervix is found intact as regards its epithelial layer. This change in the cervix is necessarily most marked in nulliparæ. In the multipara the cicatricial tissue left by lesion sustained at a previous delivery obscures, to a greater or a less degree, the softening. As a rule, it may be stated that this softening in substance of the cervix is a very valuable sign of the existence of pregnancy. Pathological changes in the cervix due to the presence of cancer will alone, in a primipara, prevent the softening. In conjunction with other signs dwelt upon,—the nausea, the suppression of the menses, and the mammary changes,—this softening may be taken as strong presumptive evidence of impregnation.

*VII. Uterine Signs.*—Within four weeks after conception the uterus begins to assume the shape which is characteristic of pregnancy. This is especially true of the organ which has never been impregnated. The organ loses its pyriform shape and assumes that of a flattened sphere. The implantation of the fecundated ovum in the uterus is associated with an increase in the blood-supply; the uterus, becoming heavier, sinks in the pelvis; the organ develops more in its transverse diameters than in the longitudinal. Even before the changes in the cervix become at all marked, even before the subjective symptoms—the nausea and vomiting—and the mammary signs become pronounced, the uterus of the nullipara presents the following characteristic alterations as regards the body: The shape is that of a flattened sphere; the lower uterine segment—that is to say, the portion of the body of the uterus just above the vaginal reflexion—juts over the cervix. On combined abdomino-vaginal examination the body of the uterus, whilst spherical in outline, seems to be compressible. This compressibility is especially marked if the internal finger, either in the vagina or in the rectum, is applied just above the reflexion of the vagina from the cervix. Obviously the determination of this early change in the body of the uterus will depend on the ease with which it is possible to make the conjoined examination. It is particularly in women who are not especially stout that the sign will be determined with the greatest ease. As pregnancy advances—that is to say, from the sixth week on—the characteristics which have been noted become intensified, until, at the eighth to the tenth week, these changes in the body of the uterus are sufficient, in women of lax abdominal walls and in nulliparæ, to render the diagnosis of pregnancy strongly presumptive. The evidence, it must be remembered, is not sufficient to justify the physician in giving an opinion at all positive; but in his own mind there will remain little doubt as to the correctness of the diagnosis, which, if the woman be examined after the lapse of a week, will be certified in the event of the changes having become intensified, for, if the woman be pregnant, these changes become more marked as gestation progresses, until other signs of pregnancy of a more positive nature appear.

The conditions likely to simulate these changes are so-called chronic metritis and uterine fibroid. In neither of these conditions, however, is the uterus spherical in shape or compressible, nor does the lower uterine segment jut over the cervix with that doughy consistency which is associated with early gestation. Indeed, at the period when this sign is most marked—about the tenth week—the coexistence of the other early signs we have dwelt upon forms a very strong justification of the diagnosis of pregnancy; certainly the weight of evidence will be in favor of such assumption.

*VIII. Abdominal Signs.*—At an early period of gestation, beginning with about the twelfth week, the linea alba becomes darkened, the color deepening as gestation advances, and the change being most marked in brunettes. About the twelfth week the abdomen itself begins to enlarge, for it is about this time, in women with normal pelves, that the uterine tumor reaches the level of the pelvic brim. From this time on, abdominal palpation and conjoined abdomino-vaginal examination reveal signs of considerable value in reaching a diagnosis of pregnancy. From the eighth week on the gravid uterus contracts rhythmically, giving us the sign known after Braxton-Hicks, who first called attention to it. These intermittent uterine contractions may be obtained, in women with lax abdominal walls, by elevating the uterus on the finger inserted into the vagina, and by grasping and gently rubbing the body of the uterus through the abdominal walls. The uterine tumor will be found to harden and to relax at intervals. Of course, as gestation progresses these intermittent uterine contractions become more marked, but their especial diagnostic value is between the eighth and the twelfth weeks of pregnancy. About the fourth month, when the uterus has risen above the pelvic brim, conjoined manipulation through the abdominal walls will elicit contractions. The only conditions which are likely to simulate these contractions are myomata of the uterus, hæmatometra, and a distended bladder. The history and the shape of the uterus should suffice to differentiate the former conditions, and the catheter will eliminate the last.

Whilst intermittent uterine contractions are not alone sufficient to justify a diagnosis of pregnancy, the sign must be considered a very valuable corroborative one. It is never absent when the uterus contains a product of conception, and if it be absent there will not be present other presumptive signs of pregnancy. Another sign to be secured through the abdomen is *ballottement,*—the term given to the motion imparted to the fœtus when one or the other of its extremities are struck, the other portion impacting at the opposite side of the abdominal wall. Ballottement may be either direct abdominal or combined abdomino-vaginal. Vaginal ballottement is secured to best advantage when the woman stands erect; but ordinarily this sign, when needed for diagnosis, can be obtained with the woman in the recumbent posture, which should always be chosen when feasible, since the innate modesty of the woman is thus better protected.

To obtain vaginal ballottement the woman stands in front of the physician, her legs separated slightly, and the physician inserts one finger into the vagina, depressing, or rather pushing, the perineum backward as much as possible, in order to reach as high up as is necessary. This intravaginal finger is placed in the anterior or the posterior fornix of the vagina and a sharp upward impulse is given, the result of which is, in case the uterus contains a fœtus floating in the liquor amnii, that this fœtus is displaced upward and falls back on the finger.

To obtain abdominal ballottement the woman lies on her bed or couch, the abdomen being covered by a sheet. The bladder should be empty. The physician determines by palpation a point of resistance in the uterine tumor, and gives a sharp impulse here, his other hand lying flat on the abdomen at the opposite pole. The fœtus is thus dislodged in the liquor amnii and the impulse is received on the flat hand. A necessary precaution prior to this manipulation is that the hands should be warmed and that the uterus should not be manipulated over-much, otherwise the organ will contract on its contents and ballottement can only be obtained during uterine relaxation.

Ballottement is hardly available before the fourth month, because, prior to this date, the fœtus is too small and the amount of liquor amnii present too slight to allow of motion to a sufficient extent. From the fourth month on to the eighth the sign may be obtained, but after the eighth month, or earlier in case of very large fœtus or of deficiency in liquor amnii, the sign is not obtainable, because the fœtus is too large to be made to float. As a diagnostic factor this sign, however, is chiefly of value between the fourth and sixth months of pregnancy, for after this latter date the fœtal heart may be heard, which alone certifies to the presence of pregnancy.

It must never be forgotten that the presence of ballottement simply certifies to the fact that there is something which floats in the uterus. This is no proof that a live fœtus exists, and the absence of ballottement is no proof that the woman is not pregnant, since, as already stated, there are conditions under which the sign cannot be obtained, although the woman is pregnant. There are, further, certain sources of error which must be borne in mind. A movable stone in the bladder may give the impulse to the vaginal finger which the fœtus does; a pediculated subperitoneal fibroid, or an ovarian cystoma, or a wandering kidney may each simulate ballotement. Care in securing the history of the patient, however, which will reveal symptoms suggestive of the presence of one or another of these conditions and the absence of certain of the symptoms peculiar to the stage of gestation which the woman has supposedly attained, ought to prevent error. Fortunately, at the period when ballottement may be secured to best advantage other symptoms of pregnancy of far greater weight are present.

Palpation of the abdomen affords information of considerable value toward the diagnosis of pregnancy. The outline of the uterus may thus be mapped out; its height above the pelvic brim may be estimated; the presence of one or more points of greater resistance may be determined, leading at times, perhaps, to the suspicion of multiple pregnancy; the presence of a complicating tumor in addition to the uterine. Such are certain of the factors which careful palpation may reveal. We would again lay stress on the fact that manipulation should be gentle, else, after the fifth month of gestation, the uterus, if gravid, will inevitably contract and defeat the aim of the manipulation.

Later on, under the head of "Abdominal Palpation," will be described the information to be secured in reference to the position of the fœtus in the uterus.

The most important information obtainable through the abdominal walls is the fœtal heart-sounds, which constitute alone a diagnostic sign of pregnancy; indeed, this is the sole sign which will enable the physician to certify to the existence of gestation in a court of law. Other signs together furnish strong presumptive evidence amounting practically to a certainty, but they are one and all liable to erroneous interpretation with the exception of the sounds of the heart.

Whilst it has been claimed that the fœtal heart-sounds may be heard as early as the sixteenth week, and whilst certain observers have noted them even as early as the twelfth week, as a rule they are not discernible until the twentieth week, and then only under exceptionally favorable circumstances, such as very thin abdominal walls and close apposition of the uterine parietes to the abdomen. From the twenty-fourth week on, these sounds should always be obtained in case the fœtus is alive, although their absence will not certify to fœtal death, since, in instances of hydramnios or in cases of thick abdominal parietes, the sounds may not be able to penetrate to the ear.

The quality of the heart-sounds has been likened to the ticking of a watch under a pillow, but the student may best familiarize himself with this quality by listening frequently to the heart-beats of a newborn child, remembering that the sounds when heard through the abdominal walls are necessarily somewhat fainter.

In listening for the heart-sounds the maternal pulse should always be noted coincidently, for thus a possible source of error—that of mistaking the communicated sound of the maternal pulse—will be avoided. The rapidity of the fœtal heart varies exceedingly, the average being about 130. This rate differs, however, within physiological limits, being dependent in a measure on the condition of the woman, and, possibly, also on the active or passive state of the child.

Whilst it has been asserted that there is a difference in the fœtal heart-beats in the male and the female, the latter being more rapid than the former, and whilst repeated attempts have been made to predict the sex of the fœtus according to the rapidity of the beats, the result of such attempts has been failure as well as success in about the same ratio. It is probable that a large female fœtus has a slower pulse than a small male, and *vice versâ*, although any prediction as to the sex of the fœtus must be considered as guess-work. This is as would be expected when it is borne in mind that the pulsations of the fœtal heart are intimately dependent on the maternal condition, and that, therefore, the rapidity of the beats may vary not alone from day to day, but also from hour to hour.

Auscultation for the determination of the fœtal heart-sounds may be mediate or immediate through the abdominal walls. The attempts which have been made to popularize auscultation through the vagina have very properly failed, not only because the desired information can be secured to better advantage through the abdomen, but also because vaginal auscultation is bound to be repugnant to the woman; and, in the absence of decided advantages, it should therefore not be resorted to.

According to individual taste, auscultation may be practiced through the stethoscope or by direct application of the ear to the abdominal wall. In either event the woman should lie on the bed or couch, the abdomen covered by a thin sheet. Absolute quiet of the woman and her surroundings is requisite, since, whilst often the sounds are very loud, again they may be exceedingly faint. At an early stage of gestation the sounds are necessarily to be sought over the fundus of the uterus in the midline; later, as the uterus rises high above the pelvic brim, the entire anterior wall of the organ may be explored. After the sixth month, as a rule, the outline of the fœtus may be mapped out, and then the area within which the sounds should be heard to best advantage is circumscribed according to the presentation of the fœtus. It has been established that the fœtal heart occupies a position about equidistant between its cephalic and pelvic poles, and, therefore, where the pelvic extremity of the fœtus occupies the lower portion of the uterus the sounds will be heard higher up than when the head of the fœtus is the lowest part of the fœtal ovoid. Thus, in breech presentations the fœtal heart-sounds are heard above the umbilicus, and in vertex presentations they are heard below. This statement presupposes a normal pelvis, however; for, otherwise, neither presenting pole can engage as deeply; and, therefore, the point where the sounds are best obtainable will vary.

As will be noted in the proper place, the site of maximum intensity of the heart-sounds is of considerable value in the diagnosis of position of the fœtus. The hearing of two sounds varying in rhythm and at different points of the abdomen, especially if repeated examinations give the same result, is strong presumptive evidence of twin gestation.

As we have noted, the only condition which will simulate the fœtal heart-sounds is the maternal arterial beat transmitted through the abdominal walls. Counting the pulsations will, as a rule, clear the diagnosis unless the woman be suffering from some affection associated with rise of temperature, in which case the increased rapidity of her heart-sounds will, of necessity, render it difficult to differentiate.

Distinct recognition of the fœtal heart-sounds is positive evidence of the presence of pregnancy. Absence of the fœtal heart-sounds does not negative pregnancy, since the fœtus may be dead. When, on repeated examination, the fœtal heart-sounds are found to be growing weaker and altering in frequency, the assumption is strong that fœtal death is imminent, in which case, if gestation has advanced far enough to be compatible with extra-uterine existence, the induction of premature labor, in the interests of the child, might seem desirable.

Aside from the fœtal heart-sounds auscultation reveals other sounds which, while not diagnostic of pregnancy, are associates of the condition. These sounds are known as the funic souffle and the uterine bruit. The funic souffle is so termed because it is considered to emanate from the umbilical cord. It is synchronous with the heart-sounds, and occasionally is so loud as to obscure these. This sign is not constant; indeed, according to some investigators it is heard in only 20 per cent. of the examined cases. Its value, therefore, from a diagnostic stand-point, of the existence of gestation is very slight. From a clinical standpoint, as regards the fœtus, its presence denotes interference with the circulation, due, perhaps, to pressure upon the cord or to knot in the cord or to winding of the cord around the fœtal neck. If accentuated souffle be associated with great rapidity in the fœtal heart-beat, the inference is justifiable that the fœtus is suffering, and if labor be progressing slowly interference may be indicated, especially if, in a breech case, there be discharge of meconium. The uterine bruit was formerly termed the placental murmur, being supposed to originate in the vessels of the placenta. Modern investigation, however, has disproved this view, since this sound persists in many instances for days after the delivery of the placenta. The sound is a blowing one, synchronous with the maternal heart, and varies markedly both in quality and in intensity. The sound is apt to be intermittent, disappearing at the height of a uterine contraction. The generally-accepted view to-day is that the sound is produced in the uterine vessels, and proof of this would seem to be the fact that a similar souffle may often be detected in connection with uterine myomata of a very vascular character. This sound is hardly appreciated through the abdominal walls until the fourth month, but it may be detected through the vagina at an earlier period. Its value as diagnostic of pregnancy is only relative, since, as we have noted, it accompanies other conditions.

### DETERMINATION OF THE PERIOD OF GESTATION.

Whilst variable within limits, in appearance these signs of pregnancy may be conveniently grouped together as characteristic of stages of gestation. The evidence on which a diagnosis of pregnancy should be based is rarely positive up to the time when the fœtal heart may be heard, and yet the concurrence of certain symptoms at a given period will furnish strong presumptive proof of pregnancy.

During the first three months of pregnancy its existence may be reasonably predicated by the presence of the following symptoms: Suppression of the menstrual discharge in a woman previously regular, associated with nausea or vomiting in the morning, should always awaken suspicion. On examination during this period we shall find, after the first menstrual period has been skipped, bluish discoloration of the urethral bulb, and a uterus lower in the pelvis than under normal conditions we should expect to find it. The cervix usually will present a sensation of softness to the touch, and the circular arteries will pulsate markedly. At about the sixth week, the body of the uterus will have assumed a spherical shape and the lower uterine segment will project over the cervix. On inspection of the breasts, if the woman be a brunette, the primary areola will be noticed and a few sebaceous follicles will be prominent. About the eighth week the changes in the body of the uterus become more marked and the entire tip of the cervix yields, to the touch, that softening in structure which is characteristic. At the tenth week the outline of the uterus is distinctly spherical, the bogginess of the lower uterine segment and its projection over the cervix are very pronounced, the nausea and vomiting are ordinarily not so marked, the mammary signs are intensified, and the violet hue of the vagina is deeper.

These characteristics are not sufficient to justify the physician in making a diagnosis of pregnancy, although the presumption in a woman who has never borne children is a very strong one. All the signs noted may be present as the result of other conditions, except, possibly, the peculiar configuration of the lower uterine segment, although it would be unusual for this group of symptoms to coexist in a pronounced degree if the woman were not pregnant. From the twelfth to the sixteenth week the nausea and vomiting usually disappear, although in some women it remains throughout gestation; the mammary signs become more pronounced; the cervical signs and those of the lower uterine segment are very characteristic; the uterus rises to the pelvic brim; and the abdomen begins to round out. About the sixteenth week, a trifle earlier in some women and later in others, the first fœtal motion is appreciated by the woman; at times, on conjoined abdomino-vaginal examination, the intermittent contractions of the uterus may be evoked. At the twentieth week, where the pelvic brim is not contracted, the uterus may be palpated through the abdominal walls midway between the symphysis and the umbilicus; in case the pelvic brim is contracted the uterus will be found at a higher level. When thus palpated the uterus will have the distinctively spherical shape of pregnancy; it will contract rhythmically on manipulation; in excessively rare instances the beating of the fœtal heart may be heard. Usually, vaginal ballottement may be secured. At this date, the twentieth week, the physician, as a rule, possesses sufficient evidence on which to base a diagnosis of pregnancy, but his opinion must be guarded, for even yet there are sources of error.

From the twenty-fourth to the thirty-second week the diagnostic signs become rapidly more pronounced. The uterus reaches the level of the umbilicus about the twenty-eighth week, its spherical outline being very marked; the cervix is softened throughout one-half its extent; the passive motions of the fœtus are intensified and may be evoked by the physician; abdominal ballottement may readily be obtained; the uterine souffle is distinct and the fœtal heart may ordinarily be heard.

We have attained, then, the period when the diagnosis of pregnancy may be certified. Even without the positive evidence afforded by the fœtal heart, the signs are distinct enough, if weighed in connection with the past history, to justify a diagnosis of pregnancy. Of course, the data are not perfect without the fœtal heart, but it must be borne in mind that the woman may be pregnant without the heart-sounds being appreciable, and, further, that the fœtus may be dead.

The evidence in our possession simply becomes stronger from the thirty-second week on to term,—the fortieth week. In women with thin abdominal parietes the parts of the fœtus may be palpated, and, if the fœtus be alive, the movements are such as can be simulated by nothing else. The motion of gas in the intestines may lead the woman astray, but the sensation of motion communicated to the palpating hand is unmistakable. On vaginal examination the cervix will be found to be gradually becoming merged in the lower uterine segment, and the presenting part of the fœtus may be felt in the anterior fornix of the vagina, except where the placenta is implanted below.

During this period—the thirty-second to the fortieth week—the changes in the cervix are very characteristic. The vaginal portion softens very rapidly, until, in primiparæ, at the end of gestation the cervix has become merged entirely in the lower uterine segment.

About the thirty-eighth week the uterus begins to sink gradually in the pelvis, attaining, in normal pelves, the height it should occupy about the eighth month of pregnancy. This sinking is due to the attempt at engagement of the presenting part in the pelvic inlet, and normal sinking may be taken as a sign that the inlet is not contracted. The respiration of the woman is easier on account of the lessened pressure on the diaphragm associated with the sinking, but the œdema of the lower extremities and of the external genitals is proportionately increased. These various symptoms are chiefly of value as indicating that labor is about to set in, although they are all corroborative of the ascertained diagnosis of pregnancy.

### Duration of Pregnancy and the Prediction of the Probable Date of Labor.

The average duration of pregnancy in the human female is ten lunar months, or forty weeks, or 280 days from the beginning of the last menstrual period. This duration, however, varies within wide limits, since it is impossible to determine the exact date of conception, and since ova are shed not alone after and before a menstrual period, but also in the interval between two periods. In certain cases gestation seems to be prolonged less than this approximate period, and in others far beyond. Under the old French law the legitimacy of a child could be disputed which was born 300 days after the death of the father; in Austria 240 and 307 days

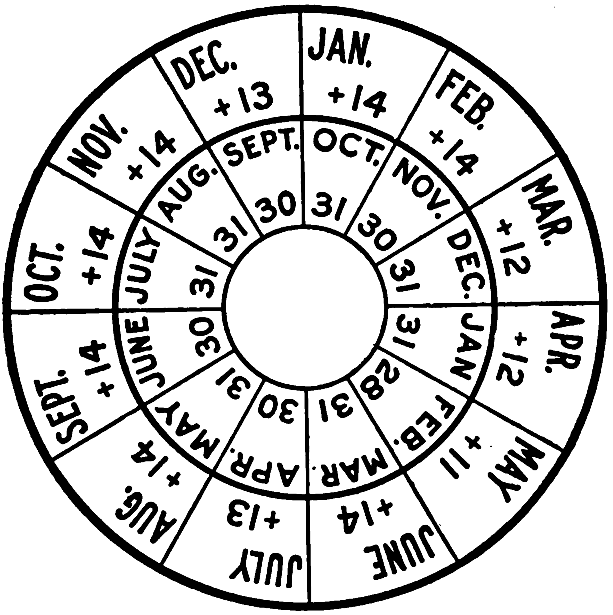
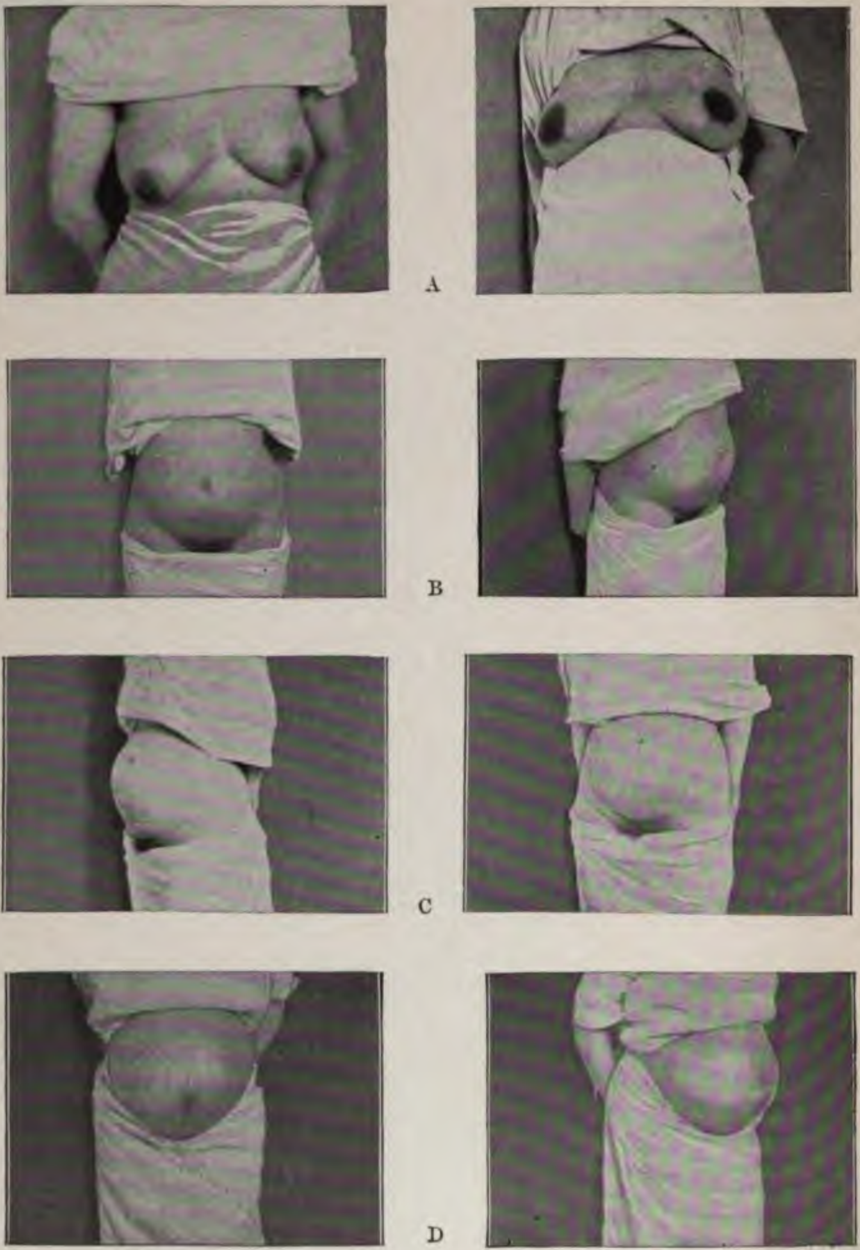


Fig. 20.—Marx's Obstetric Calendar.

are recognized as the early and the late limits of legitimacy; in England and in the United States we rightly find no dogmatic statement as to legitimacy, the fact of protracted gestation being admitted by the law. There are many undoubted instances of protraction of pregnancy beyond the 320th day after the supposed conception.

In predicting the date of probable delivery we are met, at the outset, by the difficulty that it is not possible to determine the time when fruitful coition occurred. The data which have been obtained from a large number of cases where it was ascertained with a sufficient degree of certainty that there had been but one coitus, at which time conception had necessarily occurred, has enabled us to fix the average period of gestation as being about two hundred and eighty days. Even in such instances, however, there is a margin of error of a fortnight, because the spermatozoa are capable of life to this extent, and even beyond this in the normal secretions; and, furthermore, at the time of coitus there may be present no ovum ready to be fertilized, even though the woman has but just menstruated, or none of the ova shed at this period may be fertilized, the spermatozoa awaiting the shedding of later ova. We have, hence, ground for error varying between a fortnight and a lunar month. These facts go far toward explaining instances of protracted gestation. For similar reasons the date of the last menstrual period is open to erroneous interpretation. The woman may conceive either just before the period which failed to appear, or just after that which did appear, or in the intermenstrual interval. Here, again, there is ground for error within from two weeks to a lunar month. Quickening does not furnish a reliable guide, for the reason that the period when this is first felt varies within the limits of a month; and then again many women are not conscious of the first movements of the fœtus or are deceived by the motion of gas, for instance, in the intestines, into the belief that life is present, or rather is felt, far earlier than it is at all likely it could be. The height of the uterus above the pelvic brim, although fairly constant under normal conditions at different periods of

## *PLATE II.*



*A. The Primary and Secondary Areolæ.*
*B. Outlines of Abdomen at Fifth Month of Pregnancy.*
*C. Outlines of Abdomen at Seventh Month of Pregnancy.*
*D. Outlines of Abdomen at Ninth Month of Pregnancy.*

pregnancy, is not reliable as a means of predicting the probable date of labor, because this height is subject to considerable variation according to the capacity of the pelvic brim, the condition of the neighboring viscera, and according to the size of the fœtus and the amount of liquor amnii present. Still, it offers an approximate guide for the estimation of the period which pregnancy has attained. This statement holds true only for the pelvis in which the pelvic inlet is of the normal type. In case of the contracted brim the uterus as it enlarges cannot sink to the same degree; so that it will be always higher above the brim than under normal conditions. At the third month the uterus approaches the brim; at the fourth month it is about on a level with the brim; at the fifth month it is situated midway between the pelvic symphysis and the umbilicus; at the sixth month it attains the level of the umbilicus; at the seventh month it rests about two fingers' breadth above the umbilicus; at the eighth month it reaches midway above the umbilicus; at the ninth month it reaches the ensiform cartilage and gradually sinks until at term it occupies the position which it did at the end of the eighth month.

When viewed in outline the abdomen has the shapes which are shown in the plates at given periods of pregnancy. (Plate II, B, C, and D.) Of course, extreme laxity of the abdominal parietes or the deposit of a large amount of fat in the walls of the abdomen interferes with the usual outline appearance.

Certain observers—the late Karl Braun, for instance—laid considerable stress on the estimated length and weight of the fœtus, the methods for determining which are given in the portion of this work devoted to obstetric surgery; but at best, even here, there are elements of error aside from the problematical nature of evidence as to weight and length of a body which can be measured only after an exceedingly indirect manner.

Our argument goes to show how much open to error is the statement of the probable date of delivery, and, as is noted in "Obstetric Surgery," this is very unfortunate when it is desired, for one or another reason, to induce premature labor without imperiling unduly the chances of fœtal viability. A generally accepted rule, and one which enables us to approximate the date of delivery within from one to two weeks, is the following: Having determined the date of the last menstrual period, add seven to fourteen days to the day of cessation of the period, according to the usual protraction of the menstrual period in the given individual, and count forward nine calendar months, or, what amounts to the same thing and is more convenient, count back three months. We shall thus, in the average case, come within a week of the correct time, which will be found to vary between 275 and 280 days from the last menstrual period. Even under this rule there is an element of great uncertainty, for many women have an apparent menstrual flow for one or more periods after they have conceived. In such cases the height of the uterus and the ascertained date of quickening will be found not to correspond with the date of apparent conception.

A further element of error on which we must dwell, although the theory on which it is based is as yet not proved within the limits of scientific exactitude, is the contention that during the fruitful life of woman she is constantly engaged in preparing her sexual organs for insemination. The menstrual period is looked upon as an act which cleanses the system of the products which have been laid up during the intermenstrual period for the nourishment of the ovum in the event of its becoming inseminated. Now, in some women the duration of this cycle is less than in others. For instance, in certain women in every respect healthy the menstrual period anticipates the lunar cycle,—that is to say, recurs every 21 instead of every 28 days, whilst in other women the cycle is uniformerly prolonged beyond 28 days. If then labor should occur, as has been claimed, at or near what would have been a menstrual epoch had the woman not conceived, in many women the duration of gestation will be about 270 days, and in others nearer 300 days instead of about 280. It is apparent, therefore, that the physician, in order to avoid an exceedingly wide margin of error, should not rest content with the determination of the menstrual date, as regards the last beginning or cessation, but should also question his patient as to the ordinary recurrence of the flow, and make due allowance for this before giving an opinion.

A fairly reliable point in regard to impending labor may be secured by the determination of the date of sinking of the uterus. As we have stated, the uterus sinks into the pelvic brim, under normal conditions, about two weeks before labor. At a late date of pregnancy, also, the changes in the vaginal portion of the cervix give a fairly reliable guide. So long, in primiparæ, as this portion of the cervix remains unmerged in the lower uterine segment, labor is not likely to occur unless it should do so prematurely.

## Differential Diagnosis of Pregnancy.

Whilst the diagnosis of pregnancy, under normal conditions, may frequently be reasonably predicated even before the absolute sign, the fœtal heart-sound, is discernible, often it is an exceedingly difficult matter to attain a positive diagnosis. In neurotic women, especially at the time of the menopause, all the rational signs of pregnancy may be present, associated with increasing abdominal enlargement. These women are either exceedingly anxious to bear a child or else they have subjected themselves to the risk of conception apart from the married state. Such women give a clear history of the early signs of pregnancy,—the amenorrhœa, the nausea and vomiting, the enlargement of the breasts and of the abdomen, the sensation of fœtal motion; they are not trying to deceive the physician, but are deceiving themselves. Numerous instances are on record where they have made every preparation for the impending labor, and many cases are also on record where the physician has been himself a party to the deceit. To this condition the term "pseudocyesis" has been applied, meaning false pregnancy. A careful estimation of the symptoms and an equally careful local and combined examination should serve to convince the physician of the true state of affairs. If the uterus can be grasped bimanually, it will always be found much smaller than the supposed date of pregnancy, and it will always lack the peculiar shape to which allusion has been made. The cervical alterations will never be present, and on auscultation the characteristic sounds will never be heard. If the woman is too stout to allow of bimanual examination, or if the accumulation of gas in the intestinal tract is too great to enable the external hand to properly depress the abdominal wall, then at times the symptomatology is marked enough to call for anæsthesia to determine the true state of affairs.

The persistence of an apparent periodical menstrual discharge during the early months of pregnancy, and at times throughout gestation, is by no means uncommon, and this will tend to render the diagnosis of pregnancy difficult. The question of differential diagnosis here may usually be settled by careful local examination. A submucous cervical polyp may be at the bottom of the discharge, and on its removal the anomalous symptom ceases. Hæmorrhage, however, during pregnancy is not so important as casting doubt on the existence of the condition as it is a signal of a pathological condition associated with the pregnancy. Local examination should always be resorted to, since early malignant disease of the cervix may be the causal factor, or the placenta may be implanted in the lower uterine segment, both of which conditions the welfare of the woman requires should be detected early. It should be remembered, also, that hæmorrhoids or polyp or malignant disease of the rectum may give rise to hæmorrhages, and that in an obscure case the lower bowel should be examined. The mistakes made by eminent men should serve as a warning never to rest satisfied with a superficial examination.

Long-standing congestion of the pelvic organs may lead to the presence of many of the early symptoms of pregnancy. The nausea and vomiting, the bluish discoloration of the vagina, the enlargement of the uterus, the apparent softening of the cervix, the enlargement of the abdomen, the mammary signs,—all these symptoms may exist and yet pregnancy be absent. Here, again, careful examination and a proper appreciation of the signs should serve to guard against error in diagnosis. The uterus will never be found to have the spherical outline which may be determined even at a very early stage of gestation in the nullipara, and with less exactitude in the pluripara. The apparent softening of the cervix will, on inspection, be found dependent on an erosion of the epithelial layer of the cervix, the result of acrid discharge from the uterus; the enlargement of the abdomen may be determined as due to the constipation which is such a frequent associate of pelvic congestion; the sensation of fœtal motion will be determined as due to the presence of flatus in the intestines.

Fibroid tumors of the uterus may at times render the diagnosis of pregnancy difficult. This will especially be the case in women with a large amount of adipose in the abdominal walls. Whenever careful bimanual examination is possible, however, the differential diagnosis ought not to present difficulties. The cervical signs of pregnancy are absent; the uterine outline is not apt to be spherical unless the fibroid is symmetrical, and then the consistency of the uterus is harder than in pregnancy, and, instead of amenorrhœa, the menstrual flow is either natural and regular or else there is a history of hæmorrhages. The rational signs of pregnancy will rarely be present,—after a suggestive manner, if at all. If the fibroid be subperitoneal, on careful palpation the tumor will be found independent of the uterus or projecting in a nodular fashion from it. Of course, the two conditions, fibroid and pregnancy, may coexist, and then the differential diagnosis may be difficult; but the after-course of events will, very shortly, on renewed examination clear the diagnosis. It is, in particular, fibroids inserted in the lower uterine segment which are likely to obscure diagnosis, and this for the reason that their presence interferes with careful bimanual examination. In these cases the combined abdomino-rectal examination will be found serviceable, as enabling us to map out the outline of the uterus, and perhaps to obtain ballottement. When the fibroid is large, occupying perhaps the entire abdominal cavity, it will frequently be no simple matter to exclude a complicating pregnancy. The inability to hear the fœtal heart-sounds offers the strongest corroborative evidence, however, although it must be remembered that, owing to the position of the fœtus or of the complicating tumor, this sound might not be transmitted to the ear. Very seldom, however, will the grouping of symptoms give us preponderating evidence of the existence of gestation in its absence, when the symptoms of fibroids are marked.

Large ovarian cysts, filling the abdominal cavity, are hardly likely to simulate gestation. The early history of pregnancy will be lacking; the enlargement of the abdomen, usually, will have been slower; the percussion outline of the tumor will not yield the spherical shape of the gravid uterus; the intermittent uterine contractions will be absent, and it will not be possible to obtain the fœtal heart-sounds. The facies of the woman, again, is utterly different, that which is associated with an ovarian cyst of large size being almost pathognomonic of the condition. Of course, pregnancy may coexist with the ovarian cyst, and then the diagnosis may be most difficult. As a rule, the question to decide will not be as to the existence of pregnancy, but rather the coexistence of a complicating factor, since the major signs of pregnancy—the fœtal heart-sounds and the cervical signs—are apt to predominate. A condition which is likely, on the other hand, to simulate ovarian cyst, is hydramnion, where the large amount of water present is apt to obscure the major signs of pregnancy, such as the fœtal heart-sounds. But then the cervical signs are present to influence our conclusion. Small ovarian cysts, impacted in the pelvis, are much more likely to obscure the diagnosis. Not uncommonly the rational signs of pregnancy will be present,—the nausea and vomiting, the amenorrhœa, the enlargement of the breasts, with possibly prominence of Montgomery's follicles,—and the close apposition of the cyst to the lower uterine segment will simulate the signs in this locality which are characteristic of gestation. In such instances, if the symptoms are of a nature urgent enough to require speedy diagnosis, it is advisable to anæsthetize the woman in order to make the careful bimanual examination which ought to clear the diagnosis. If a waiting policy is allowable, then, in the course of a few weeks, the diagnosis may be reached through the development of signs more characteristic of pregnancy. In any event, remembering that to-day the surgical rule is to remove an ovarian cyst before it has attained great size, it will not be wise to temporize overlong, but, in view of the safety of anæsthesia, to resort to this method of certifying the diagnosis.

Ascites should not lead to difficulty in differential diagnosis except where pregnancy coexists, and then many of the characteristic signs of gestation may be masked by the enlargement of the abdomen due to the presence of fluid. Particularly is this apt to be the case where the fluid is encysted, for then we shall not obtain the evidence of free fluid in the peritoneal cavity yielded by change in position of the woman, but we may have a tumor similar in outline to that of the gravid uterus. The rational history here, however, will not be that of pregnancy, and local examination will reveal the absence of the cervical and uterine changes of gestation. In a very obscure case, however, it may be necessary to resort to anæsthesia in order to reach a diagnosis.

The condition above all most difficult to differentiate, and yet calling for early and accurate diagnosis, is the distinction between uterine and extra-uterine gestation. On the differentiation the life of the woman may depend, and, fortunately, the information obtained in modern times usually enables us to avoid making the mistakes in diagnosis of the past. The symptoms of early ectopic gestation may be exactly similar to those of normal pregnancy. There is the same rational history of amenorrhœa, and of nausea and vomiting, coincident with the mammary and the local signs. Generally, however, on close questioning, certain points of value from the differential stand-point will be evoked. Thus, usually a history of precedent disease of the genital system may be obtained, associated with a period of relative or of absolute sterility. At the eighth week of gestation or thereabouts the woman has irregular hæmorrhages, at times associated with such sharp, colicky, abdominal pains as to cause fainting or actual collapse. The hæmorrhage is of special significance, since this is inconsistent with *normal* pregnancy. These symptoms should always call for a local examination, when, in addition to the enlargement of the uterus which accompanies ectopic gestation, a tumor will be found in the region of the broad ligament, which is, to a greater or less degree, tense and giving evidence of congestion. Such symptomatology should always awaken the keen anxiety of the physician. It will not follow that uterine pregnancy is absent, but the chances are that ectopic pregnancy complicates. The woman should be watched and examined daily to determine if the tumor to the side or behind the uterus is enlarging. When the hæmorrhages recur the discharge should be examined for the presence of the decidual membrane which is shed in these cases, but which is rarely seen. Should microscopic examination reveal decidual cells, and, in particular, should no chorionic villi be found after repeated examination, the evidence strongly favors the existence of ectopic gestation. If the symptoms recur, then the time has come for examination under anæsthesia to reach a more exact diagnosis, when, if the inference is strong that ectopic and not uterine pregnancy exists, the course of treatment outlined in the section dealing with obstetric surgery should be followed. If the case be not seen until after rupture into the layers of the broad ligament with development of the fœtus, instead of its death, then the diagnosis is often impossible, notwithstanding all our methods. Fortunately, the woman does not run the same immediate risk that she does prior to the twelfth week, and expectant treatment may be allowable until term. Usually, in these instances of broad-ligament gestation advanced beyond the fourth month, examination under anæsthesia will enable the physician to differentiate the uterus from the ectopic-gestation sac with sufficient degree of certitude to warrant him in examining the interior of the uterus for the purpose of proving it empty. Whilst the fœtal heart-sounds will be heard, it is questionable if the intermittent uterine contractions are ever present in the ectopic sac, and then the fœtus can be palpated much more readily through the abdominal walls than is possible in normal pregnancy, except in very exceptional instances when the uterine walls are excessively thin.

## MANAGEMENT OF GESTATION.

Whilst gestation is a physiological process and, in a normal woman under normal conditions, ought to progress without entailing greater strain than the system is prepared to stand, the great alterations in the sexual organs and the concomitant strain to which every other organ in the body is subjected call for watchfulness on the part of the physician and radical change in many respects in the habits of the woman.

Since the system is subject to extra strain, it follows, at the outset, that extra food is requisite in order that the system may bear this strain after a physiological manner. As a rule, the woman should be allowed to eat whatever she finds agrees with her, eating as freely as is possible of fresh meats, vegetables, milk, fruits, and water. Highly-spiced articles of diet are objectionable, not on the ground that they are apt to affect the fœtus unfavorably, which is the popular idea, but because such articles do not, as a rule, contain the elements best qualified to nourish the system. Where the nausea and the vomiting of early pregnancy are pronounced, it will often be a very difficult matter to persuade the woman to ingest sufficient food to nourish her, and yet this is a period of gestation when it is, above all, essential that the system should be well nourished in order to prepare it for the great strain it will be subject to as gestation progresses. Fortunately, we are able now to utilize a large number of predigested articles of diet which contain the essentials for proper systemic nourishment. In aggravated cases of nausea we can nourish efficiently for the time by utilizing the rectum. Ordinarily the appetite of the woman will depend largely on the state of the intestinal canal. The nausea and vomiting of early pregnancy should not be considered a pure neurosis, but the fact should be recognized that torpor of the liver and the consecutive constipation are responsible for a large share of the disturbance. Women are by nature and by force of habit of a constipated type, and, when the interference by the growing uterus with the lower bowel is superadded, this habit simply becomes intensified. Further, it is surprising what a mass of fæcal matter the average woman unconsciously carries in her colon, and this, too, although she will state that her intestinal tract is emptied each morning. So it is, but rarely thoroughly. As a rule, it will be found advisable to instruct the woman to take a laxative each night or every other night on retiring. Enemata, as a routine measure, should be avoided, since their constant use can but result in aggravating the hæmorrhoids which are an associate in many instances of late gestation, and because, furthermore, injections into the rectum are very apt to irritate the uterus and may induce premature labor.

The hygiene of the skin should receive careful attention. Daily baths are not only allowable, but are indicated as one of the means for relieving the great strain to which the kidneys are subject during gestation. These baths may be taken, contrary to lay opinion, up to term. Vaginal injections, if the water be lukewarm and not in excessive amount, are not likely to do any damage; indeed, are valuable as a means of keeping this canal reasonably clean. Where the normal secretions of the vagina are intensified during pregnancy, or where there is present a profuse secretion from the cervical canal leading to irritation of the external genitals, these injections should be ordered, associated with some astringent, such as powered alum 1 teaspoonful to the quart of water, and, in aggravated cases, the physician should apply astringents to the vagina, such as nitrate of silver, in the strength of 1 drachm to the ounce of water. Such a measure will be forced on the physician in the presence of a leucorrhœa of a very acrid nature, otherwise the nervous system of the woman will suffer from the constant pruritus. Sexual intercourse during gestation must be left to the desire of the woman. The only advice the physician can give is in regard to moderation. Of course, in instances where abortion or premature labor is feared it should be absolutely interdicted.

As regards the urine of the gravid woman and the action of the kidneys, the matter is of such vital importance that the reader is referred to the chapter on the "Pathology of Pregnancy," under the heading of "Toxæmias."

The clothing of the woman should be warm, and yet not so heavy as to tire her. The abdomen and the breast should not be subject to compression. The average corset should be discarded and one or another of the modern waists, devised to support these regions and yet not to compress, should be worn instead. It is essential that the abdominal walls should have ample space in which to expand, that the respiratory functions should not be impeded through interference with the action of the diaphragm, and that the nipples should not be compressed by inelastic pressure. During the later months of gestation, particularly if there be a tendency to pendulous abdomen, the woman will find comfort in the application of an abdominal binder pinned from below upward so as to support the weight of the uterus. This binder, also, will relieve the dysuria from which many women suffer. Daily exercise, of the gentler type, should be taken, the guide as to the amount being dependent on the sensation of fatigue which the woman suffers. It stands to reason that overfatigue should be avoided, and yet it will be found very difficult to persuade many women to take exercise at all. This should be insisted upon, and at a time of the day when the sun is shining, and not after dark, as many women, if not expostulated with, will prefer. In the absence of a special symptom contra-indicating, railroad travel may be safely undertaken from the third to the seventh and one-half or even eighth month, and sea-voyaging is not to be forbidden except in the case of women who suffer from nausea. Indeed, many women are improved in health during gestation by such means of travel.

It may be laid down as a rule to be rigidly insisted upon, that the pelvic capacity of every woman should be gauged at as early a date as is possible, not alone to determine whether the woman is so built as to be able to bear a child in safety at term, but also to find out if there are present in the pelvic canal tumors not appreciable externally and yet of a nature to render delivery at term impossible. This subject of pelvimetry is amply exemplified in the portion of this work which deals with obstetric surgery, and we insist upon it here because it is, above all, necessary to impress upon the student that, without the data obtainable through pelvimetry and examination of the abdomen, he knows nothing about his patient except that she may be gravid. It is as safe to make a diagnosis of cardiac disease without listening over the area of the heart as it is to pretend to care properly for a woman during gestation and at term without having made a thorough examination at as early a date of pregnancy as is possible.

The mental condition of the pregnant woman will frequently require anxious oversight. Women of an emotional temperament are apt to become moody and despondent, brooding over their condition and fearing all sorts of untoward consequences. Fresh air and exercise and the effect of moral suasion suggest themselves as the best remedy for this condition. The physician may do much to dispel the woman's anxiety, and it will often be his duty to relieve the mind of the woman in regard to the possible effect of the so-called maternal impressions on the fœtus. However strong the apparent evidence may be in favor of the view that such impressions may affect the fœtus unfavorably, there is just ground and stronger ground for the belief that such impressions do not affect the fœtus.

The care of the mammary glands during gestation is of the first importance. The nipples should be kept free from pressure, and the breasts, if pendulous, should have due support. The wearing of a tight compressive corset should be discountenanced. The circulation throughout the breasts should be free, and the proper kind of support is that which aims at the prevention of local congestion without the exercise of pressure. Nowadays the so-called shirt-waists are the proper articles to wear for the giving of support. The nipples should be bathed frequently for purposes of cleanliness, but alum, tannin, and the like should not be used, since their only effect is to injure the delicate protecting epithelial layer. Traction on the nipples should not be allowed, since this is apt to set up uterine contractions, and it is very questionable if such traction will cause nipples to project which are lacking in erectile tissue. If the nipples are in a normal condition, after the birth of the child they will soon adapt themselves to the demands of lactation. It is, above all, necessary to avoid irritating the nipples by local applications and by traction, since it is recognized to-day that the most common cause of puerperal mastitis is the presence of cracks in the nipples through which elements of infection gain access to the glands. In case the nipples are depressed and altogether lacking in erectile tissue an attempt may be made at frequent intervals to cause them to project, but these attempts should be of a gentle nature and are only allowable because, if they should fail, the woman will not be able to nurse her child.

# CHAPTER III.

## PATHOLOGY OF PREGNANCY.

THE pathology of pregnancy includes all morbid conditions of the woman or the child which lead to deviations from the normal. Certain of these conditions must be looked upon as physiological, since, to a greater or a less degree, they are constant accompaniments of pregnancy. Therefore, the morbid conditions from the side of the woman must include: The pathological exacerbations of physiological processes and the accidental complications of pregnancy.

It is difficult and occasionally impossible to determine where physiological action ends and morbid condition begins. This is rendered doubly so from the fact, as is dwelt upon elsewhere, that we are not dealing with an individual in a condition of nature, so to speak, but with one whose physical being has been altered by the demands, rational and irrational, of civilization. Much which, in a state of nature, was physiological has been altered by civilization into a process which, in many respects, verges on the pathological.

We will consider at the outset the exaggerations of physiological processes which accompany gestation, and next dwell upon the accidental complications in pregnancy.

### THE PERNICIOUS VOMITING OF PREGNANCY.

Whilst the nausea and the vomiting of pregnancy are physiological accompaniments, when the condition is exaggerated it is termed "pernicious" and is an exceedingly grave complication. Fortunately it is rarely met with in the aggravated type, and certain German observers have gone so far as to deny its occurrence. A sufficient number of authenticated instances, however, have been reported, both here and abroad, to prove the grave nature of the complication.

Pernicious vomiting has been observed more frequently amongst primiparæ than multiparæ. The etiological factor cannot always be determined. Frequently reflex nervous action is at the bottom of the condition. Again, the cause may depend on morbid condition of the cervix, such as cervical metritis, erosions, and hypertrophic elongation of the cervix. On the other hand, instances are on record where none of these factors were at work. Modern chemical research leads to the conclusion that vomiting of the pernicious type is due to a toxæmia, particularly if gastric ulcer or chronic gastritis can be excluded. The urinary findings, as is amply dwelt upon further on under the topic of the "Toxæmias," aid in differential diagnosis.

In general, it may be stated that the pernicious vomiting is but an exaggeration of the morning nausea and vomiting, which are the rule rather than the exception in pregnancy. At the outset, at least a portion of the ingested food is restrained at the midday and evening meals. The nausea is often associated with violent straining; so that the woman eventually complains of considerable abdominal tenderness. If the condition become aggravated, then the nausea persists, even though there is nothing in the stomach. Occasionally the condition is complicated by profuse salivation. Constipation is usually of an obstinate type.

As the affection progresses the woman becomes wasted, feeble, and feverish. The pulse becomes accelerated,—an index of weakness. The vomited matter consists of watery material tinged with bile. When the retching is severe the material may be tinged with blood. The tongue becomes brown and dry and fissured. Emaciation becomes extreme, and the woman passes into a typhoid condition. At times there occurs a reverse peristaltic action of the intestinal tract, and fæcal vomiting ensues. Even when the woman has reached this extreme condition it is not often that the fœtus is expelled prematurely, and, strange to relate, in certain cases where the woman has been tided over to term the child has presented very little evidence of lack of nutrition. It has seemed to thrive even at the expense of the exhausted mother.

*Prognosis.*—Hyperemesis of gestation should always occasion anxiety, and the prognosis should always be guarded. Especially is this the case where the woman reaches an extreme degree of emaciation and has had hectic fever.

*Treatment.*—The woman should be placed in bed and kept prone, since this position alone frequently ameliorates the nausea and the vomiting. Careful alimentation is to be insisted upon. A cup of black coffee taken the first thing in the morning allays in a measure, at times, the condition. Solid food must be interdicted, although the woman will not ask for it and could not retain it if administered. Milk and lime-water, one-third of the latter to one of the former, should be tested in small quantities at intervals of two hours. It should be borne in mind that at times the most readily digested foods are not retained and the craving of the woman should have respectful attention.

If all food be rejected it will be necessary to resort to rectal alimentation. Inasmuch as it may become necessary to feed by the rectum for a protracted interval, great care is necessary from the start that the rectum does not become irritated. This may in a measure be prevented by washing out the lower bowel frequently with cold water.

Peptonized milk, defibrinated blood, or egg-albumen, 4 ounces every three or four hours, may be utilized. The rectum is apt to retain its tolerance longer if a few drops of the tincture of opium be added to alternate enemata, and absorption of the food is more rapid if it be acidulated with dilute hydrochloric acid. It is to be borne in mind that all mucous surfaces absorb saline solutions very freely. Hot black coffee makes an excellent stimulant enema, and this may be added to advantage to the peptonized milk.

The rectum and the stomach should not be both utilized at the same time. Either one or the other should be given absolute rest. Lavage of the stomach should always be tested. The stomach-tube is inserted and about every six hours the organ is thoroughly flushed with a 2-per-cent. boric-acid solution.

It is needless to dwell upon the many drugs which have been recommended. Scores have had their advocates. There exists absolutely no specific. The drug which apparently assists one woman proves a lamentable failure in another. Oxalate of cerium has a very wide reputation. It may be tested in 5-grain doses frequently repeated, on the ground that if it does no good it will not do harm. Cocaine, in 4-per-cent. solution, administered 10 drops every three hours, may be tested for a few doses; but its effect will be found to be but transitory and it may possibly intensify the nervous condition in which, of necessity, the woman is. Ingluvin, administered in 20-grain doses every six hours, at times affords relief. Small doses of creasote, a few drops of tincture of iodine well diluted, Fowler's solution in $^1/_2$-drop doses every hour for six doses, drop doses of ipecac frequently repeated,—such are certain of the remedial agents which have been tested and which result in failure only too frequently. To quiet the restlessness of the woman in extreme cases it may be requisite to administer hypodermic injections of morphia; but this should be avoided as long as possible, since we must aim at keeping the intestinal tract in order.

The best results are probably yielded by washing out the stomach and by rectal feeding. It must be remembered that local conditions may be at the bottom of the hyperemesis. Any abnormality of the pelvic organs should be looked for and rectified if possible.

Remembering that normally the uterus is anteflexed and slightly anteverted, and that a degree of retroversion is not incompatible with the normal progress of gestation, the physician should simply look for exaggeration of these positions. In case retroflexion exists an attempt should be made to lift the uterus forward. In mild cases the woman should be placed in the left semiprone position, the fingers are inserted behind the organ, and pressure, directed forward and upward, may succeed in rectifying the displacement. If the organ is impacted behind the hollow of the sacrum, then a Sims speculum is inserted, a tenaculum is hooked into the anterior cervical lip, the uterus is drawn downward and then may possibly be pushed forward as the cervix is carried backward. Fortunately women with marked retroflexion rarely conceive. The manipulations should be gentle, of course, else the woman may be caused to miscarry. After reposition, a pessary of the Albert-Smith type, with large posterior bar, should be inserted to maintain the uterus in position.

In case of marked anterior displacement posture is sufficient. In case the cervix is eroded it should be painted with a solution of nitrate of silver, 30 grains to the ounce, and next dusted with boric acid.

Dilatation of the cervical canal has frequently proved of benefit. Anæsthesia is not requisite; indeed, the administration of either ether or chloroform will simply intensify the vomiting. Painting the cervix with a 10-per-cent. solution of cocaine may, in a measure, allay the pain, which at best is slight. The steel-branched dilators, figured in "Obstetric Surgery," should be selected for dilatation. The vaginal canal should first be irrigated with bichloride solution 1 to 5000, and the hands and the instruments should be sterile. The dilator is inserted to the level of the internal os, the organ being steadied by a tenaculum inserted into the anterior lip. The process of dilatation is slow and gradual. In aggravated cases the internal os must be dilated as well. This procedure may induce abortion, but we are only anticipating what may be forced upon us. Very exceptionally, however, if the dilatation be carefully performed, will the uterus throw out the ovum.

It is never justifiable to allow the woman to reach an extreme degree of emaciation. As a rule, active interference has been deferred too long. After the measures we have stated have been tested and yet the woman's condition becomes progressively worse, the time for active interference has arrived. It has been proven that, even in the face of the most desperate exhaustion, emptying of the uterus may avert a fatal termination. In particular is this true where diacetic or oxybutiric acids or free acetone are found in the urine. Cases of this type are probably the most dangerous of all, and call specifically for rapid delivery.

Counsel should always be obtained before resorting to the induction of abortion. The operative measures are described in "Obstetric Surgery."

Aside from this pernicious vomiting of pregnancy there are certain disturbances of function associated with pregnancy which call for consideration. Salivation to an extreme degree is a rarity; still, instances have been recorded where the woman has, in consequence, been reduced to an extreme condition and where it has been necessary to interrupt gestation. This salivation is simply a reflex sympathetic phenomenon of pregnancy, and within limits need give rise to no anxiety. The best remedy for the milder instances is belladonna or its alkaloid, atropia, pushed to the physiological extent.

The serous diarrhœa from which certain women suffer may be the result of pressure of the growing uterus on the intestines, and it will often be cured by the thorough evacuation of the intestinal canal by a laxative and high enema. The latter should be administered with care, lest the uterus be irritated and throw off the ovum.

Many women suffer from neuralgias, especially facial and sciatic. Often full doses of arsenic will grant relief, or the antiperiodics,—quinine and Warburg's tincture. Toothache will usually be dependent on caries of one or more teeth, when the physician need not fear to counsel extraction. The risk of abortion being induced is to be dreaded less than the nervous strain the woman will be otherwise subject to.

In the latter months of pregnancy the woman will frequently suffer from cramps in the thighs and the legs. Massage of the extremities, by equalizing the circulation, will relieve these temporarily.

## CARDIAC DISEASE COMPLICATING PREGNANCY.

When a woman with organic disease of the heart becomes pregnant she should always give her physician great concern. When we remember that, normally, the heart bears additional strain during pregnancy, it is easy to understand why the organ, already crippled, may be unable to perform its functions. Fortunately, as a rule, hypertrophy of the organ compensates the lesion. This certainly holds true in instances where the cardiac lesion is not of an aggravated type.

Acute endocarditis not infrequently proves fatal through its tendency to become ulcerative. Women suffering from chronic endocarditis are rarely able to withstand the strain of gestation, since, as a rule, compensatory hypertrophy has already taken place, the woman being fairly comfortable until the greater hypertrophy is demanded by the occurrence of pregnancy. The heart is unable to stand the increased arterial tension which is associated with pregnancy, and not infrequently, although the woman passes through gestation, a fatal issue occurs during or immediately after labor. There exists inability on the part of the heart to accommodate itself to the sudden variations in the vascular tension during labor.

The reason why acute endocarditis complicating pregnancy is so prone to assume the ulcerative type cannot be stated. The impaired nutrition which is so frequently associated with pregnancy, together with the extra work the heart is called upon to perform, may co-operate to produce this result.

In case of chronic endocarditis the symptoms will depend on the site of the lesion and upon the extent of the injury to the valves. In case of aortic stenosis and insufficiency the symptoms often become marked during the early months. The woman will suffer from dyspnœa, a hard, dry cough, and occasionally she will have hæmorrhages from the lungs, stomach, gums, and nose. Where the cardiac lesion is not of an aggravated type the woman may go to term, and during labor these symptoms will manifest themselves or become greatly exaggerated. Syncope and cardiac paralysis may ensue.

Where the mitral valve is injured, if the lesion is slight and compensatory hypertrophy is complete, the woman may not manifest any cardiac symptoms unless an acute exacerbation occurs. Pregnant women suffering from cardiac disease are peculiarly liable to fresh attacks of endocarditis, on exposure to cold, for instance, or on unusual exertion. Compensatory hypertrophy may be sufficient to enable the woman to bear the extra strain of pregnancy during the early months; but often, without special warning, the woman may develop pulmonary œdema of a type rapidly fatal.

The effect on the fœtus in these aggravated instances is that it often dies *in utero*, or, if delivered alive, it is weak and succumbs at an early day.

Whilst not a contra-indication to marriage, cardiac disease is certainly badly affected in each succeeding pregnancy. In an early stage of the disease the woman may pass through her pregnancy and her labor without any untoward symptom. Each recurring pregnancy, however, aggravates the lesion; so that as soon as hypertrophy seems to fail or secondary dilatation takes place it is dangerous for the woman to conceive again.

In any event the physician will do well to give a guarded prognosis. Of course, where there exists disease of the heart secondary to disease of the kidneys his prognosis must be all the more guarded. Aside from pulmonary œdema, the complication to be feared in advanced cases of cardiac disease is embolism, and this possibility obviously always renders the prognosis more grave.

*Treatment.*—Since, where the cardiac lesion is aggravated, the infant rarely survives even though the woman be carried to term, we are not justified in jeopardizing the maternal life in order to give the child a very problematical chance of living. The broad rule may therefore be laid down that, where compensation does not exist or where secondary hypertrophy has set in, nothing will be gained by endeavoring to tide the woman to term. Medicinal treatment of the cardiac lesion will not vary from that which holds irrespective of gestation, except that earlier resort to the cardiac strengtheners will be needed. When, notwithstanding, the symptoms become intensified,—in particular the dyspnœa,—then, no matter what the period of gestation, the safe rule, after due consultation, is to empty the uterus, and this after as rapid a fashion as is consistent with the integrity of the maternal soft parts, absolutely no account being taken of the child.

If the woman reach term and is taken in labor the same rule holds,—which is to empty the uterus just as soon as this is feasible without inflicting unnecessary lesion on the maternal soft parts. The woman must be counseled against making any unnecessary effort. As soon as the cervix is dilatable or dilated, if the conditions for version (see "Obstetric Surgery") are present, this operation should be elected; if not, then the forceps should be applied.

Anæsthesia is requisite, and the physician should not hesitate, on account of the presence of the cardiac lesion, to resort to it. There is a choice in the anæsthetic. Ether should be avoided where kidney disease complicates, and also since it tends to provoke pulmonary œdema. In general, chloroform should be selected and be administered most carefully, since danger of cardiac syncope is imminent.

After delivery the physician should remain by his patient for a number of hours, since, frequently, everything has passed smoothly and of a sudden the woman dies. The attendance of the physician may not avail much, but he will receive the credit for having been in watchful attendance.

Strychnia hypodermically, $^1/_{16}$ grain repeated every two hours, will assist the heart in withstanding strain. Inhalations of oxygen will relieve the dyspnœa. Hypodermic stimulants—camphor, musk, digitalis, and the like—should always be in readiness to be used *pro re nata*, but spurring a weakened organ by drugs must be avoided.

If the woman die before delivery has become effected, the physician's duty is to perform the Cæsarean section, although this will rarely avail to save the child. Since relief from the strain of labor often adds to the life-limit of the woman, in cases where she reaches term and the cervical canal is soft and dilatable we question if, at times, it be not justifiable to anæsthetize the woman, perform manual dilatation, and deliver by version. This procedure commends itself in particular because, under the given conditions, it spares the woman many hours of strain which her weakened heart cannot stand as well as it may the necessary anæsthesia. The actual condition being critical, it must be met by emergency measures. In the event of the cardiac being secondary to a kidney lesion it may be necessary to elect the rapid delivery in order to avoid impending eclampsia.

There is probably no complication of pregnancy where it is less possible to lay down fixed rules for guidance. Each case constitutes an entity which must be treated according to the emergency nature of the symptoms. It must never be forgotten, however, that frequently the storm does not break until after delivery, and that therefore it is wisdom not to allow the labor to be protracted, which simply means extra exhaustion. Since it is of the utmost importance to conserve the vital forces as far as is possible, the physician should be prepared to tampon the uterus with sterile gauze in case of inertia after the completion of the third stage of labor, in order to spare the woman the loss of blood, which she cannot stand.

## Diseases of the Kidney Complicating Pregnancy.

Although the literature relating to disease of the kidney complicating pregnancy is enormous, it must be admitted that a satisfactory explanation of the clinical facts has not been offered. It is not the purpose of the authors to attempt a *résumé* of the many theories advanced. The aim is to offer the student the data which justify a line of treatment which is in accord with the preponderating modern belief, frankly admitting that researches in the future may lead to modification of the statements in many respects.

At least two etiological factors appear to offer the best explanation of the renal complications of pregnancy: (1) the alteration of the blood associated with gestation; (2) the mechanical interference with the venous circulation through the abdominal and the pelvic viscera.

The blood of the pregnant woman is usually more watery than under normal conditions. It contains a greater proportion of the white corpuscles and a proportionate diminution in the red. This being the case, it seems plausible to assume that, as in other conditions associated with impoverishment of the blood, renal lesion may occur, with the excretion of albumin. We thus find a possible explanation for the occurrence of the albuminuria of gestation.

The other factor noted—the mechanical interference with the venous circulation—has many warm advocates, and yet a number of valid objections offer. Ovarian tumors much larger than the full-term uterus or fibroid tumors may cause as much pressure and consequent interference with the venous circulation; and yet these tumors do not, as a rule, lead to the renal lesion. When, however, we remember the intimate relationship between the circulation of the pelvic organs and that of the kidney, and also that this blood from the pelvis is all returned into the general circulation through the renal veins, then it appears allowable to lay considerable stress on the pressure theory as a cause of the renal lesion. It is a well-known fact that no tumor, be it ovarian or fibroid, malignant or benign, causes such development of the pelvic vessels as is associated with pregnancy. Hence it cannot be the mere pressure of the gravid uterus; but we must look farther for a cause of the renal lesions, and we may find it in the mechanical obstruction offered to the return of the blood through the renal veins. Further, the position of the renal veins protects them from direct pressure exerted by the gravid uterus. The lower part of the uterus being within the pelvic cavity and the promontory of the sacrum preventing backward pressure, the renal veins cannot be compressed, lying, as they do, in front of the second lumbar vertebra. Further still, after the gravid uterus has risen above the brim it presses forward against the anterior abdominal wall.

The renal complications of pregnancy may originate with this condition or they may be dependent upon previous attacks of nephritis, which are exacerbated on the supervention of gestation. The acute nephritis of pregnancy frequently attacks women who have never suffered from renal lesion. It ordinarily manifests itself without any marked disturbance of the general health and without any febrile reaction. Often the first symptom noted is œdema, and this is not limited to the feet, which frequently is associated with normal pregnancy, but extends not alone to the lower extremities, but also to the eyes and the hands. On examination of the urine albumin may be detected, sometimes only a trace, and, on microscopical examination, casts may or may not be found.

Again, œdema may not be present, and, unless it is the routine practice of the physician to examine the urine of his patients at regular intervals for urea as well as albumin, the renal condition may not be recognized at all. The woman may then be delivered without complication, or during labor or afterward eclampsia may ensue.

Frequently it is a difficult matter to diagnosticate this nephritis complicating pregnancy from a chronic parenchymatous nephritis. In the latter the specific gravity of the urine is not apt to be so high nor is the amount of albumin apt to be so great. Again, the number of casts is apt to be greater in parenchymatous nephritis.

In chronic interstitial nephritis albumin may never be found in the urine unless very frequent examinations are made, and even then the amount may be very slight. Indeed, high tension of the pulse, lessened amount of urine, diminution in the amount of urea, œdema, headache, and visual disturbance are more important from a diagnostic stand-point than the presence of albumin.

A further class of cases is furnished by women who are the victims of nephritis and become pregnant. Here all the former symptoms become exacerbated. The albumin increases in amount and the casts in number. Such women rarely progress to full term, the fœtus often dying *in utero*, the result being dependent, according to many, on changes in the placental structure.

It has been noted that eclampsia is far less frequent among women affected with chronic Bright's disease than among those who develop acute nephritis during pregnancy. This may, in part, be due to the fact that the former class of women are very apt to abort at an early stage of gestation.

*Clinical History.*—We have noted that renal complications may exist during pregnancy without the supervention of any special symptoms. Such, however, is the exception. At any rate, that physician is less likely to be taken by surprise who systematically examines the urine of his patients at stated intervals during pregnancy and who is watchful for the symptoms which are self-suggestive of kidney-lesion.

The urine of women suffering from chronic nephritis is usually markedly lessened in amount through concentration, and is high-colored. This applies, in particular, to instances of chronic parenchymatous nephritis. Headache and visual disturbances are frequent. Œdema may be very extensive. On exertion the woman is apt to complain of shortness of breath. High tension of the pulse is a fairly constant symptom. In case these symptoms increase as pregnancy advances, then, before labor, or during or afterward, eclampsia may develop.

Eclampsia occurs once in from five to six hundred pregnancies, unless the woman develops an acute nephritis during pregnancy, when the proportion rises to about 25 per cent. In this latter class of cases the maternal mortality ranges about 30 per cent. and the fœtal about 50 per cent.

In the vast majority of cases there are certain premonitory symptoms of eclampsia. Exceptionally, however,—and this point is to be remembered,—eclampsia occurs without previous evidence of kidney-lesion or premonitory symptom. The marked premonitory symptoms are: Headache; œdema of the feet, extremities, face, and external genitals; imperfect vision (spots before the eyes; at times, transient inability to see at all); dyspnœa; high-tension pulse.

The characteristic symptoms of eclampsia can scarcely be mistaken for any other condition. During the first few attacks the woman may simply pronate and supinate the forearms, closing the fingers upon the thumbs. Soon, however, the wide-open eyes become fixed in a vacant stare, the pupils being contracted, and this is followed by the rapid opening and closing of the lids and the rolling of the eyeballs from side to side. The muscles of the face partake in the convulsive action, the mouth being drawn to one side, perhaps, the head being tossed from one side to the other with great rapidity. The lower extremities are also in motion, the legs being rapidly flexed and extended.

During the seizure the heart's action becomes irregular, the vessels of the neck are prominent, and the face has a cyanotic hue. Respiration is impeded and becomes stertorous. As the seizure passes off the face resumes its natural color, the heart's action becomes regular, and the breathing quiet. As a rule, the seizures do not last more than about thirty seconds, and in the intervals the woman may be aroused, except the attacks recur with great frequency.

When the convulsions are tonic in character the head and the mouth are drawn to one side, the eyes are fixed, and opisthotonos may occur. The heart's action is very irregular and respiration may be suspended. This tetanic spasm is also of short duration,—about thirty seconds; but such violent interference with the heart's action, if repeated, must eventually result in cessation and death. As regards the number of seizures, they are variable, as many as seventy-five to one hundred in twenty-four hours having been noted. After delivery, in favorable cases, the convulsive seizures become less frequent, or cease at once. Occasionally, however, the attack does not manifest itself until some time after the birth of the fœtus.

From this analysis of the symptomatology of eclampsia we feel justified in accepting the view that, whatever the prime etiological factor, a secondary factor is *uræmia*, or, rather, *urinæmia*. Either the excretion of urea is interfered with or else there is increased production over elimination. This fact would seem to be certified by the results secured through resort to treatment the aim of which is to favor the elimination of the urine in full amount. Whether the urea acts as a poison after decomposition in the blood or not is uncertain and, as yet, theoretical. Sufficient the recognition of the fact that, in a large proportion of cases, if not in all, we are dealing, in part, with the effects of a poison on the higher cerebral centres and on the spinal centres. In short, the preferable descriptive term to use for this condition is *toxæmia.* The poison—whatever it be—is unquestionably of a mixed character. Whilst urea and its derivatives play a part, these are not the sole factors.

*Prognosis.*—The prognosis of eclampsia is always grave, although of late years this has been very much modified through resort to measures of a less temporizing nature in the presence of the preliminary renal evidence which usually forebodes the occurrence of the seizure.

*Treatment.*—Seeing that renal lesions may and very frequently do affect pregnancy in an unfavorable manner, it is especially incumbent on the physician to examine the urine of his patients at intervals in order to detect the supervention or the presence of nephritis. When only traces of albumin are detected or when symptoms suggestive of impending toxæmia have not manifested themselves, much may be accomplished by dietetic measures. The woman should be restricted to a non-nitrogenous diet. Milk is by far the best food for the woman suffering from the acquired or existing lesion of the kidney, whether it be only functional or organic. The consensus of opinion is that meat should be absolutely forbidden as well as alcoholic beverages. Articles of diet containing much starch, such as bread and potatoes, should be partaken of in moderation. Since anæmia is an accompaniment of lesion of the kidney, and since, when absent, the tendency is toward it, iron in an easily assimilated form, such as the peptonate, should be given in full doses. This is a precaution which should never be neglected in instances where it is necessary to keep the woman for a prolonged period on an absolute milk diet.

The woman must be protected from the possibility of taking cold as far as may be. She should be told to wear flannel, and this will also tend to keep the skin moist, such diaphoresis assisting and relieving the kidneys. The sweat-glands eliminate the urea, or, rather, the carbonate of ammonia into which it is altered. An abundance of water should be drunk in order to flush the kidneys, so to speak. Frequent hot baths are valuable adjuvants as exciting the sudoriferous glands to action, and, in case symptoms of impending toxæmia manifest themselves, then the hot pack should be administered, associated with high rectal irrigation, the temperature of the water being about 118° F.

Another channel through which the urea and its product may be eliminated is the intestinal canal. Therefore the bowels should be kept free by the administration of laxatives.

In instances where there is high tension of the pulse glonoin should be ordered in full doses,—that is to say, $^1/_{50}$ grain should be administered every three hours until the tension abates, and then the drug should be given at greater intervals *pro re nata.* By attention to these measures it may frequently be possible to carry the woman to term and to deliver without the supervention of eclampsia. It must be remembered, however, that this untoward complication may set in even when the "sky is most serene," and therefore the greatest watchfulness is called for until the woman has been delivered.

In instances where, notwithstanding these dietetic and hygienic measures, the albumin increases in amount or the urea diminishes, and the other symptoms—headache and œdema—become intensified instead of lessening, the time for dallying has ceased and it becomes the duty of the physician, after due consultation, to take steps for the emptying of the uterus after the manner described in the section of "Obstetric Surgery." As stated in that portion of this work, we should not wait until the symptomatology has become extreme. If we do, even though we save the patient's life,—and this will rarely be possible,—it will be with greatly aggravated disease of the kidneys and possibly with impairment of vision or hemiplegia or paraplegia.

When eclampsia develops suddenly, with or without the premonitory history we have dwelt upon, then time is not to be lost. The uterus must be emptied by as rapid a measure as is consistent with the integrity of the woman's genital tract. We cannot hope by delay to save the child, and each recurring convulsion simply makes matters worse for the woman.

Whilst awaiting the action of the method selected for emptying the uterus much may be accomplished by resort to measures which tend to lessen arterial tension. Venesection, in particular, is indicated where the pulse is full and bounding. As much as ten to sixteen ounces should be allowed to flow, according to the effect on the pulse. The tension may further be relieved by the hypodermic injection of glonoin, using $^1/_{50}$ grain at a dose and repeating hourly if required. This drug may be used more freely than is generally recognized, and with positive good effect without danger. Inhalations of chloroform to the extent of surgical narcosis form the most reliable of all methods for controlling the eclamptic seizures. Where venesection and glonoin are contra-indicated by the absence of the full pulse of tension, morphia hypodermically in full dose will tend to quiet the woman. Chloral-hydrate, in doses of 40 grains by the rectum, will have the same effect, and bromide of soda in the like dose may be added to the enema. While yet in the experimental stage, it may be noted that thyroid extract appears to have an influence as a metabolic stimulant where convulsions are imminent or, if they be present, to allay their severity. This extract is administered in 10-grain doses repeated every six hours. During its administration, the depressing effect on the heart is to be borne in mind, and this may be held in check through the hypodermic administration of the citrate of caffeine, two grains at a dose, repeated according to indication. Further still, during the convulsive period, when the tension in the cerebro-spinal canal is materially increased, the withdrawal of cerebro-spinal fluid by means of spinal puncture tends to restore the equilibrium within the canal. At times this procedure has been followed by cessation of the convulsions. The operation suggested of decortication of the kidneys, may be of value after the uterus has been emptied and anuria still persists, but as a therapeutic measure of value it can only be looked upon as an unnecessary method of resorting to venesection. Indeed, in some of the cases recorded, the capsule of the kidney has been found not adherent. In other words, the therapeutic effect of this operation, if any, is due to the blood removed from the patient and not to the release of tension on the kidneys due to an adherent capsule.

These measures are of value in keeping the woman quiet and in sparing her nerve-force whilst the measures are being taken for the emptying of the uterus. As is noted under the subject of "The Induction of Premature Labor" ("Obstetric Surgery"), the ordinary measures for the emptying of the uterus in the face of a complication which cannot be termed one of emergency are too slow in the presence of eclampsia. The elective accouchement, the so-called *accouchement forcé*, here finds its sphere. If need be, the "Dührssen" incision of the cervix may be resorted to, or if the cervix be intact, the vaginal Cæsarean section is indicated. (*Vide* "Obstetric Surgery.")

## PYELITIS COMPLICATING PREGNANCY.

Inflammation of the pelvis of the kidney has recently been carefully described and studied by a number of observers. Usually the affection is due to an infection, pure and simple. Occasionally, the causal factor is irritation from gravel or renal calculus with subsequent infection. In primary infections, at times the agent is the gonococcus or the tubercle bacillus. The majority of instances, however, are due to the colon bacillus. This organism reaches the pelvis of the kidney directly through the bladder, or else through the walls of the ascending colon. In mild cases the lesion is limited to the pelvis of the kidney; occasionally a suppurative nephritis ensues.

*Symptomatology.*—The symptoms are practically those of the condition aside from pregnancy: Pain in the lumbar region extending along the course of the ureter, frequent urination, and repeated chills are characteristic and call for examination of the urine. The odor is fœcal, the reaction is acid, and albumin is present in amount varying according to the greater or less presence of pus. Microscopically, the small round cells of the pelvis of the kidney are present. Almost always, bacteriologically, the Bacterium colon commune, will be determined.

*Differential Diagnosis.*—Appendicitis is the condition which simulates pyelitis most closely. The latter offers pain of a more diffuse character extending along the urinary tract. The changes in the urine are characteristic. Spasm of the rectus muscle, the accompaniment of appendicitis, is likely to be absent. The gradual merging of the point of maximum tenderness over the *caput coli,* the low temperature and aggravated pulse-rate, characteristic of acute infectious appendicitis, assist in the diagnosis. Further, the Meltzer position—the straightened right leg carried at right angles to the body, and the exaggerated pain in the appendiceal region, assist in the diagnosis.

*Prognosis.*—As a rule this is good, and very seldom will it be necessary to interrupt pregnancy. In the severer types of the disease where the ureter is blocked by stone or multiple abscesses exist in the kidney, the prognosis at once becomes doubtful. Here, also, interruption of pregnancy is rarely called for, the passage of a renal catheter or extirpation of the diseased kidney being indicated.

*Treatment.*—The ice-bag is applied over the suspected kidney, the subject is kept in bed lying on the side opposed to the diseased organ, large quantities of water are ordered, and the formalin preparations, such as urotropin, are ordered in doses of ten to fifteen grains every four to five hours. Codein in large doses, two grains by mouth and four by rectum, repeated every six hours, will alleviate the pain, and is to be preferred to morphia or other derivative of opium, since it is less constipating and does not upset the digestive tract.

### APPENDICITIS COMPLICATING PREGNANCY.

Ordinary surgical rules apply to this complication. The treatment is the same as though pregnancy did not exist. As a rule women do not miscarry unless delay rules and operation for the diseased appendix is postponed until rupture and general peritonitis occur, when, of course, the prognosis is the graver owing to the very fact of the complication.

### GALL-STONES COMPLICATING PREGNANCY.

Pregnant women appear to be predisposed to gall-stones, and their treatment is absolutely along the dietetic and medicinal and surgical rules applicable to the condition occurring irrespective of pregnancy.

### DIABETES COMPLICATING PREGNANCY.

In studying this subject we must carefully differentiate glycosuria occurring as a functional derangement and that which is characterized by the constant and, it may be, increasing presence of sugar in the urine. During pregnancy, even as is true aside from the condition, sugar is frequently found in the urine, especially after eating, but is of a transitory nature and need occasion no anxiety, even as it gives rise to no symptom. It is diabetes proper with which we are concerned, and this may exist before the supervention of pregnancy or may develop during its course. As a rule, unless the condition has existed before the occurrence of pregnancy, the glycosuria will rarely be diagnosticated until the later months, for, if the characteristic symptoms are not prominent, the physician will not examine the urine for sugar.

The complication must be considered a rare one, unless we assume, as is plausible, that it is often overlooked, for very few cases have been recorded.

The occurrence of glycosuria after delivery and during lactation, however, is quite common, and this fact has led to the impression that there exists a causal relationship between the function of the mammary glands and the development of diabetes. Certainly, what is termed physiological, or functional, glycosuria is quite common during lactation.

Diabetes proper, when associated with pregnancy, is apt to be of a malignant type, so much so that certain observers claim that the diabetic woman should be counseled against marriage, —a view which we share. The symptomatology of diabetes does not differ from that aside from pregnancy except that the proper symptoms of the latter condition are intensified. The gastric symptoms are increased and the urinary excretion is of greater amount than is the case in diabetes unassociated with pregnancy. Salivation to an exaggerated degree is apt to be present

Where a fatal issue has occurred in the few recorded cases, this has been due to coma. The question, therefore, arises: Are we justified in allowing a diabetic woman to go to term? The answer to this question must as yet remain an open one. Much will depend on the condition of the woman. If by means of the recognized dietetic measures the amount of sugar in the urine can be held in check, and if the woman do not offer other untoward symptoms of constitutional failing, such as increasing emaciation, cephalalgia, tendency to sleep, then under the most careful oversight she may be allowed to go to term. But if the reverse hold true, then nothing is to be gained by temporizing. The woman may at any time during the progress of gestation pass into coma; even if she reach term the disease has simply been aggravated, and it is questionable if her child will survive; during lactation, if this be attempted, the disease will simply become aggravated. It is wise conservatism, therefore, in any case where the progress of the affection is toward the worse, to induce abortion after due consultation.

Such statistical data as are at our disposal prove the wisdom of this advice. Of the twenty-four cases of which we can find record there were six maternal deaths from coma. These deaths occurred in all but one case before term.

If the emptying of the uterus be determined upon, then a rapid method should be selected, since the woman will not bear protracted strain. The use of liberal doses of bicarbonate of soda is recommended on the ground that thus the inevitable coma may be counteracted.

## THE TOXÆMIAS COMPLICATING PREGNANCY.

The toxæmias of pregnancy emanate from the kidneys, the liver, the intestinal canal, and, possibly, from the fœtal excretions. This latter statement is purely hypothetical, but thus we may explain certain conditions to which the gravid woman is subject which cannot be explained on any other supposition. As has been elsewhere dwelt upon, that woman best passes through pregnancy whose great emunctories—the sewers of the body, are kept in proper condition, and, therefore, the corollary that the physician who does more than his perfunctory duty best subserves the interests of the subject committed to his care. The old-fashioned methods of occasionally testing the urine for albumin and, exceptionally, for casts, must be forgotten in the light of modern research. Indeed, to state the matter in a nutshell, the physician who promises to care for the pregnant woman is derelict to his duty who does not watch kidneys, liver, and intestinal canal after the approved modern methods.

As regards the kidneys, the urine should be examined systematically every four weeks throughout gestation, and oftener if there be indication, and the examination, to be of value, should be made after the following fashion: Instruct the woman to collect the total amount of urine passed in the twenty-four hours and to measure this amount. Thus we are in a position to estimate the sufficiency of the kidneys, taking into account the normal liquid and solid substances which the woman is in the habit of ingesting daily. Again, thus we are in a position to estimate the amount of urea excreted daily, again in relation to the character of the food ingested. If the kidneys are sufficient and the urea output, under the given conditions, is within normal limits, then we need have no anxiety as regards toxæmia developing from the side of the kidneys. If, on the other hand, the kidneys are insufficient, or the urea output is below the normal, then it is our duty to watch those kidneys carefully by making repeated examinations, the woman being dieted, after self-suggestive fashion. Furthermore, this total amount of urine passed in the twenty-four hours should be examined for the presence of indican, since modern research has established that an excess of this agent means excessive intestinal fermentation, and then convulsions may develop unless measures be taken to cause the intestines to functionate properly. Further still, where there is reason to suspect hæpatic inaction or insufficiency, this total amount of urine should be examined for leucin and for tyrosin, and also, exceptionally, for free acetone, factors which, when present in excess, point infallibly to the possibility of eclampsia of hæpatic origin being imminent. In short, the educated physician of the present must also be in a measure a physiological chemist, in order to do his full duty by the woman who commits herself to his care. In large centres experts may be secured who will perform such essential uranalysis; in country districts the physician of conscientious type will properly equip himself. As regards the nitrogen determinations, which are very properly dwelt upon by writers on "Obstetrics," it may be stated that the methods of determination are entirely too complicated to come properly within the ken of the active practicing physician. While they are of great practical value, fortunately, should attention be paid to the determination of the elements just mentioned, nitrogen determinations can be neglected until such time as the general practitioner can afford to maintain a physiological chemist at his beck and call.

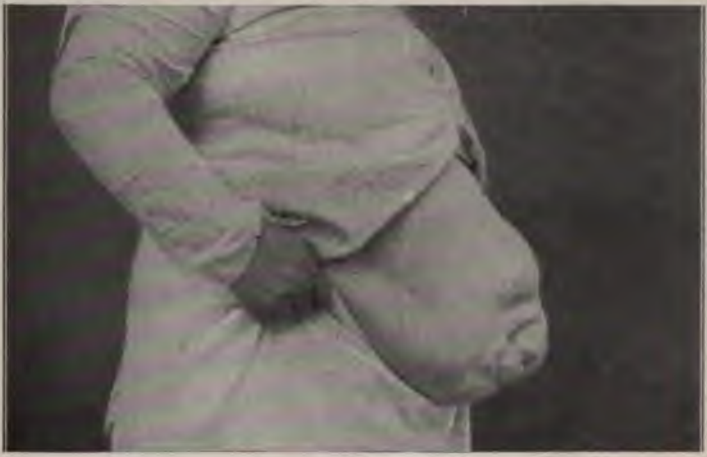
In addition to the woman being instructed to collect the total amount of urine passed in the twenty-four hours, she should be told to collect a fresh specimen, such as that passed immediately on arising. This fresh specimen is used for the purpose of determining the casts and their nature. Of late years the significance of casts and of albumin in the urine has undergone much modification. Women may carry both and yet progress safely to and after term, without convulsions or other evidence of toxæmia, provided the kidneys be sufficient and the other factors of toxæmia be absent. A very acute and reliable observer has stated this question as follows (Sondern): As in medicine, so in obstetrics, the occurrence of albumin alone or associated with casts is no longer the bugbear it formerly was, since we know that this does not of necessity mean that there exists an inflammatory lesion of the kidneys. It has been satisfactorily demonstrated that a kidney normal in every particular, that is to say normal as regards circulation and innervation, does not excrete albumin, and, therefore, the occurrence of a so-called physiological albuminuria is open to question. It is to be remembered, however, that in any individual, after ingestion of food, transient albumin and transient casts may appear. Such is the experience of all life insurance examiners. On the other hand, slight disturbances in innervation or in circulation may cause the kidney to pass variable amounts of albumin, perhaps with, perhaps without, casts, and this indicates disturbed function and not necessarily inflammation. The fact is that recent investigation has shown that fully 50 per cent. of pregnant women possess albumin in the urine at variable intervals during pregnancy. While, therefore, we would not minimize the necessity of examining for albumin and casts, we desire to emphasize the greater necessity of estimating kidney sufficiency, urea, and, where symptoms suggest, acetone and indican. If neither albumin nor casts are present, if the total amount of urine passed in the twenty-four hours be within normal limits, taking into account the quality and the quantity of food ingested, we are secure in deeming the woman safe so far as toxæmia of renal origin is concerned. But should the conditions be reversed, then examination should be instituted for free acids and acetone and indican. The general practitioner, who pays heed to these directions, may rest satisfied that he has done his full duty so far as the limitations of his laboratory permit. Other detailed examinations must be reserved for hospital clinics or be resorted to in large centres where experts in uranalysis abound.

So far, then, we have determined that uranalysis enables us to certify as to the presence of toxæmia of kidney origin, and incidentally has called attention to the presence or absence of toxæmia of hæpatic and intestinal origin. The symptomatology of kidney toxæmia has been dwelt upon under the subject of eclampsia, and that of hæpatic origin, when extreme, becomes simply that characteristic of acute yellow atrophy. Post-mortem the same lesions are found, and it is an open question whether in the pernicious vomiting of pregnancy, of an aggravated type, we are not really dealing with such changes in the liver, plus kidney changes, plus intestinal fermentative factors—in short, a mixed toxæmia. These are hypothetical questions which physiological chemistry will determine for us. The practical side of the question lies within the domain of treatment, and this has been dwelt upon elsewhere as regards the renal tract and will receive attention further on under the subject of "Hæpatic Disease Complicating Pregnancy."

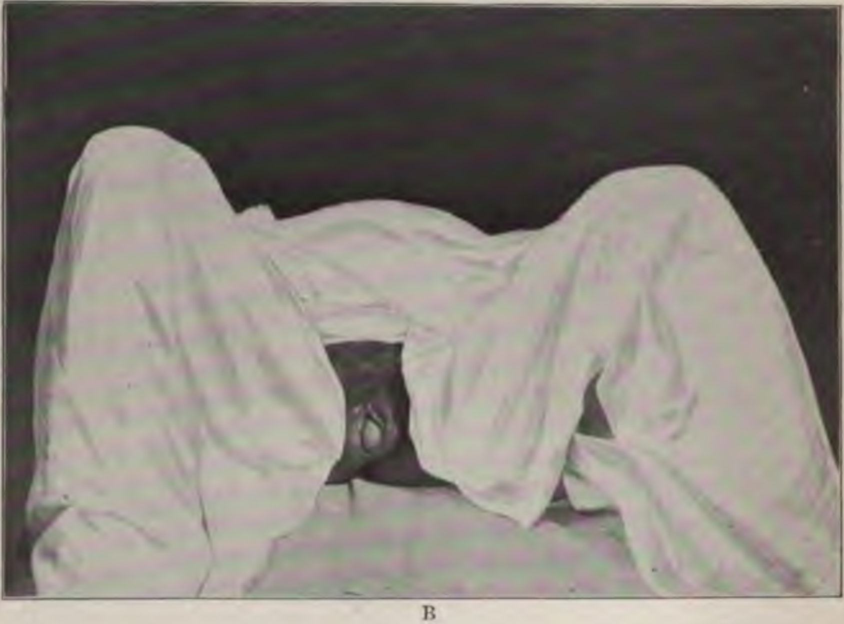
## Displacements of the Pregnant Uterus.

In the early months of pregnancy the customary anteversion and flexion of the uterus become somewhat exaggerated; but this never produces any symptom aside from the dysuria or the frequent micturation, which is dependent on the sinking of the heavy organ and on consequent traction on the neck of the bladder. In women of lax muscular development and in those on whom abdominal section has been performed the uterus may meet with insufficient support from the anterior abdominal wall and fall forward, constituting what is known as pendulous abdomen. This falling forward of the uterus is found in particular in multiparæ, especially those who have borne children in rapid succession. The symptoms associated with pendulous abdomen may become very marked and labor may be interfered with. The application of a suitable abdominal binder is indicated for the rectification of the malposition.

PLATE III.



A



B

A. *Ventral Hernia Complicating Pregnancy.*
B. *Cystocele Complicating Pregnancy.*

The condition is especially aggravated when there exists also a ventral hernia. In this complication, as a rule, the developing uterus pushes the intestines upward, and risk of incarceration hardly exists. Where, however, the hernia is adherent, then, at any time, symptoms of strangulation may offer. If we have reason to fear this occurrence, then, after due consultation, it will be wise to interrupt the course of gestation. Should the strangulation occur suddenly, then operation on the hernia is indicated, and this may or may not interfere with the progress of the pregnancy. Since, however, the development of the uterus will cause the site of the abdominal union, after operation, to yield and result in recurrence of the hernia, the welfare of the woman demands here, as well, evacuation of the uterus. (Plate III, A.)

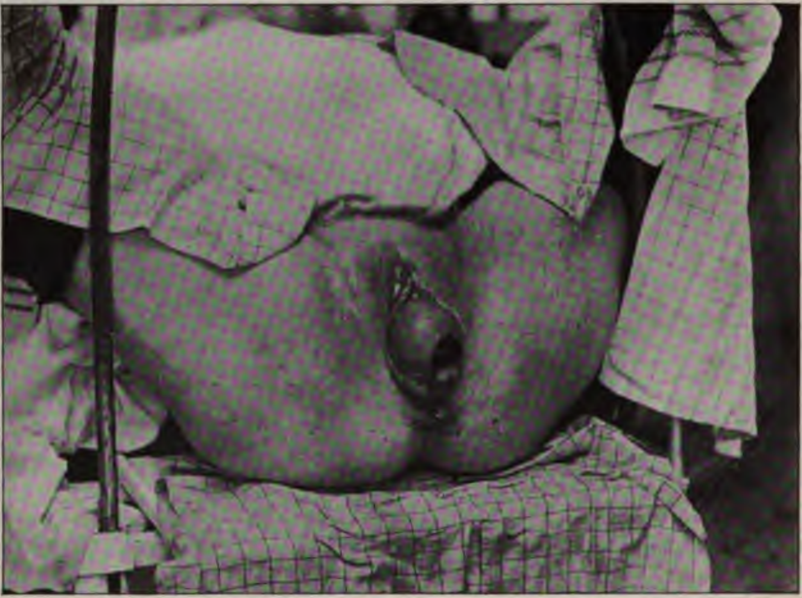
Owing to the fact that endometritis is an associate of retroversion, pregnancy rarely occurs, or, if it does, gestation is interrupted spontaneously, since the diseased endometrium offers an unsuitable soil for the development of the ovum. If pregnancy should occur, however, and early abortion not ensue, then, if there be no posterior adhesions, either the uterus rises above the pelvic brim or else retroflexion occurs, and the fundus may become incarcerated below the promontory of the sacrum.

If the uterus does not spontaneously rise above the brim, then symptoms of incarceration ensue. The symptoms will at the outset be more marked from the side of the bladder, because the peritoneum of the anterior *cul-de-sac* is drawn more tense, and distension of the bladder after the normal fashion is interfered with, and also because the cervix is forced forward and may press so firmly against the vesical neck as to prevent the escape of the urine. The incontinence of retention is a very characteristic symptom of the condition. Such symptom should always suggest the presence of an incarcerated fundus. These symptoms develop gradually. Painful defæcation or obstipation may exist from the start, the result of the pressure of the fundus on the rectum. Frequently pelvic peritonitis ensues. Not infrequently spontaneous abortion occurs before the symptoms become aggravated to this degree. In very rare cases rupture of the bladder has resulted. Pressure-gangrene may follow the incarceration. The diagnosis, as a rule, may be made with ease. The vesical and rectal symptoms being out of proportion to those which may accompany early pregnancy, a vaginal examination is made and a soft body is found, occupying the posterior *cul-de-sac,* which may be readily traced upwards to the cervix, which lies tucked under the symphysis. Examination by the rectum will clear the diagnosis. Error is only likely in case the woman is very stout, when we may be unable to determine the absence of the body of the uterus in front, and the condition may simulate a soft fibroid or an exudate in the posterior *cul-de-sac.* In such obscure instances anæsthesia should be resorted to, since, if the correct diagnosis be not reached, symptoms of a grave nature will ensue.

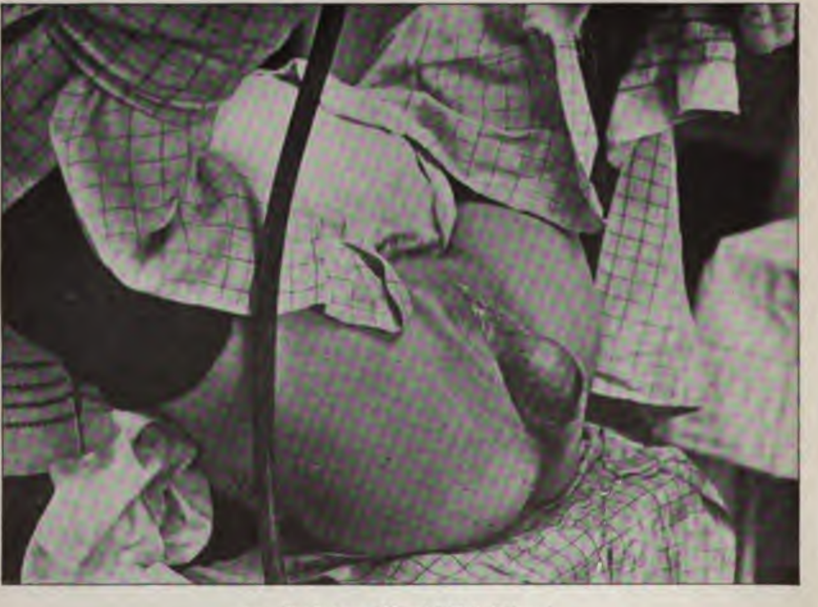
A large cystic ovary and an extra-uterine gestation-sac are other conditions which will be necessary to differentiate. In both of these instances, however, the fundus of the uterus can be made out anteriorly except the woman be very stout, in which event anæsthesia is called for.

The treatment of retropositions of the gravid uterus consists in reposition. This may prove an easy or be a very difficult affair. The bladder should be emptied. It will rarely be necessary to puncture the bladder, since ordinarily the soft catheter may be inserted. In case of difficulty, however, then, under strict asepsis, the puncture may be made in the anterior fornix, selecting the mid-line, or else suprapubic puncture is necessary. The rectum is next emptied by enema, and then the vagina is rendered sterile according to the methods outlined in "Obstetric Surgery." The woman is next placed in the Sims, or in the knee chest, position, a tenaculum is inserted into the anterior cervical lip, and traction is made in the axis of the pelvic outlet. Two fingers of the left hand are next inserted into the vagina, after the speculum has been removed, and the attempt is made to push the fundus forward. Should this fail the like manipulation through the rectum may succeed, since the pressure can thus be directed higher against the fundus. As the

## PLATE IV.



1. *Prolapsus Uteri (Front View).*



2. *Prolapsus Uteri (Side View).*

pressure is exerted it must be to one or the other side of the midline, in order to dislodge the organ from beneath the promontory of the sacrum.

These manipulations, if carefully performed, will rarely cause abortion; but even if they do the result is simply that which would have occurred had we failed in rectifying the malposition, to say nothing of the major risks the woman would have run.

In the event of there existing posterior adhesions, then attempts at reposition will, of course, fail. In many cases these adhesions stretch and the uterus rectifies itself. But it is never wise to await this result, since incarceration is more likely to occur than spontaneous rectification. In any event, as soon as symptoms of incarceration set in, if it be impossible to correct the malposition, abortion should at once be induced, always, except in strict emergency, after the support of a consultant has been secured, unless, in full view of the added risk, the woman elects the breaking up of the adhesions through an incision in the posterior vaginal fornix or per abdomen.

Prolapse of the uterus to the first and the second degrees frequently complicates pregnancy, but it usually rectifies itself as the uterus rises out of the pelvis. Prolapse to the third degree is rare, and if the organ cannot be replaced and maintained in position abortion will ensue. (Plate IV.) Hypertrophy of the cervix may simulate prolapse, but vaginal and rectal examination will differentiate, since the body of the uterus will be found in fairly normal position.

The recumbent posture and reposition will correct the symptoms associated with prolapse of the milder grade. After the uterus has risen above the brim the prolapse cannot recur to much degree, although the pressure symptoms will be aggravated. In the event of its being impossible to replace the uterus or to maintain it in position, then, after consultation, the organ should be emptied, thus anticipating that which will otherwise occur spontaneously.

## ABNORMALITIES OF THE VAGINA.

Certain diseases of the vagina are intensified by pregnancy. Catarrhal vaginitis will frequently be a source of great discomfort during pregnancy. The discharge becomes aggravated, and it may be very irritating, leading to pruritus. If there be a history of gonorrhœa the infection must be exterminated, not alone in the interests of the woman, but also of the child, since infection of this nature is the source of ophthalmia neonatorum. The vagina should be carefully painted, through a cylindrical speculum, in order to expose the rugæ, with a solution of nitrate of silver 30 grains to the ounce, and frequent douches of bichloride of mercury should be ordered, in the strength of 1 to 5000; protargol and argyrol in a 50-per-cent. solution may be similarly applied, although we question if they are more effective than the silver nitrate. In case of simple vaginitis douches containing 10 grains of powdered alum to the pint of water will suffice. Applications of a saturated solution of bicarbonate of soda will allay the pruritus, or else an ointment containing 10 grains of calomel to the ounce will assist.

Gonorrhœal condylomata will grow rapidly under the stimulus of the normal congestion of pregnancy. These condylomata as they grow have a great tendency to bleed, and this might lead to serious complications during labor. Equal parts of powdered alum and calomel, freely dusted on a number of times daily, will often cause them to shrivel. The knife should not be used, owing to their great vascularity, but, in case of need, the actual cautery is called for.

Prolapse of the anterior vaginal wall during pregnancy is usually due to loss of support from lesion of the pelvic floor. Irritability of the bladder is about the only concurrent symptom. The woman is unable to empty her bladder thoroughly and the alteration in the residual urine may result in a cystitis. (Plate III, B.) Catheterization and irrigation of the bladder with boric-acid solution will tend to make the woman comfortable. The patient may, to advantage, be instructed to void her urine in the knee-chest position.

## Pregnancy Complicated by Certain Acute and Chronic Diseases.

The pregnant woman is not alone liable to accidental disease, but she is less able to resist the inroads of disease than when non-gravid. The acute infectious diseases are peculiarly dangerous, when they complicate pregnancy, by reason of their tendency to destroy the life of the fœtus. The life of the fœtus is imperiled by the high temperature, by the lack of nutrition,—owing to the effect of disease on the woman,—or it may become infected by the disease from which the woman is suffering.

Small-pox, measles, and scarlet fever are chiefly deserving of mention among the eruptive fevers. The gravid woman is peculiarly susceptible to small-pox, possibly because she has passed through the other eruptive fevers in childhood. The mortality-rate is very high, and statistics would show that it is especially apt to assume the hæmorrhagic type. Should the affection not terminate in the death of the woman the child is likely to die. The child, however, may be born with the characteristic markings showing that it suffered from the disease *in utero*, or it may develop the disease shortly after birth. In rare instances it has escaped unscathed.

Measles rarely complicates pregnancy, since the vast majority of women have it during childhood. In the event of its occurrence the hæmorrhagic type is likely to ensue, and pneumonia is a frequent sequel. Death of the fœtus not infrequently occurs during the progress of the disease, and abortion is a complication to be feared. The fœtus may contract the disease *in utero.*

Scarlet fever occurring during pregnancy is especially serious by reason of its tendency to cause lesion of the kidneys. Pregnancy causes hyperæmia of the kidneys, and to this is superadded the congestion which is the associate of scarlet fever.

The treatment of the eruptive fevers will not vary over-much from that called for aside from pregnancy. Means must be taken to control the temperature, otherwise the exaggerated rise will affect the fœtus.

Malarial fever is particularly apt to complicate seriously the puerperal state. During pregnancy there is no reason why quinine should not be administered. This drug has not been proven to induce abortion, although it is a decided accelerator of contractions when once they have set in. On the contrary, the administration of quinine in full doses, by modifying the disease, in so far spares the woman as well as the fœtus. Latent malarial infection will frequently not manifest itself until after delivery. It may then complicate the puerperal state, leading to a question, at the outset, of puerperal sepsis.

It was formerly the belief that pregnancy exercised a favorable modifying action on tuberculosis. Clinical experience does not bear out this view. Latent tuberculosis often does not manifest itself until the woman has become enfeebled by pregnancy. It seems valid to state that, on this ground, women with tubercular tendencies should be dissuaded from marriage, aside from the probability of the effect on the possible offspring.

Women who become infected with syphilis at the beginning of or during pregnancy manifest unusually severe initial symptoms and have proportionately mild secondary lesions. When the initial lesion is on the vulva it develops rapidly, owing to the normal exaggerated hyperæmia of the part. The ulcer rapidly spreads to the vagina and may even extend upward. Extension to the glands is slow, and the rash is apt to be light or does not appear at all. Syphilitic fever is rarely present.

The prognosis as regards the fœtus is unfavorable This is especially so if the woman has become affected before impregnation. Again, the fœtal prognosis is less favorable if infection occur during the early months of pregnancy. The fœtus will be affected if either parent is syphilitic at the time of conception; that is to say, the semen, or its active elements, may be the carrier of the infection. Still, if the woman were not affected until after conception the fœtus may escape. In case the infection was active in either parent at the time of conception, then the fœtus will likely die *in utero*, owing to the changes undergone by the placenta.

Women who are known to be affected with syphilis at the time of conception should be subjected to rigorous antisyphilitic treatment. Local lesions should be carefully attended to, so that, in case the child escapes the infection whilst *in utero*, it may not receive it during delivery. Before she is allowed to become pregnant again both husband and wife should be subjected to protracted mercurial treatment. The best form of administration is by injections of one-sixth to one-quarter grains of the bichloride of mercury deep in the gluteal muscles. Such injections are repeated every three to five days for a period of two months.

If the fœtus be born without evidence of the disease it should not be nursed by its mother, otherwise it may become infected. If the child be born with evidence of infection received from its father, the mother having escaped, it should not be nursed lest the woman become infected through the nipple.

Chorea is not a very frequent complication of pregnancy, and attacks by preference those who have an hereditary predisposition. It is far more common in primiparæ.

Etiologically, the lowered nutrition of the nervous system due to the hydræmia which is associated with pregnancy, together with the hereditary predisposition, must be considered as the cause.

The symptomatology does not differ markedly from that which is the associate of the disease occurring apart from pregnancy. The manifestations ordinarily set in during the early months and continue after delivery. Abortion and premature labor are frequent.

The prognosis is grave and must always be guarded. When death ensues it is the result of the constant muscular exertion which entails exhaustion.

The treatment does not materially differ from that which is proper in case of the disease aside from pregnancy. Ferruginous tonics of the easily assimilated type are indicated, and Fowler's solution should be administered in full doses. The constant administration of the potassium salts is contra-indicated on account of their tendency to interfere with the digestive process. The woman should be placed amid the best possible hygienic surroundings.

Should palliative measures prove of no avail and the woman show signs of exhaustion, then the artificial induction of abortion or of premature labor should be elected, after due consultation. Statistical data prove the folly of temporizing in extreme cases in the hope of securing a viable child. Of the 131 cases of which we find record there were 29 deaths. As a rule, in aggravated cases the child stands but little chance, since abortion or premature labor is very apt to set in spontaneously. Under the subject of "The Induction of Premature Labor," in the portion of this work devoted to obstetric surgery, we have given our reasons for recommending this procedure as one of election in all instances where the maternal condition is becoming altered for the worse.

Pregnancy is rarely complicated by icterus, but the disease assumes special importance from its tendency to become of a malignant type. Under the subheading of the "Toxæmias" we have noted this fact, and would emphasize here the statement that we are dealing with the lesions of acute yellow atrophy. The reasons for this are manifest. During pregnancy the venous congestion of the kidneys interferes with the proper elimination of the biliary salts, and there results lessened cardiac energy, owing to the accumulation of these waste-products in the blood, and therefore diminished excretion and poisoning.

The disease may manifest itself at any period of pregnancy. The prognosis for the child is gloomy, since the course of gestation is almost always interrupted. The cause of fœtal death is poisoning by the bile-salts circulating in its blood.

The causes of simple icterus occurring during pregnancy are the same as those which produce the disease apart from the gravid state. Acute duodenitis, with the consequent obstruction of the common duct, is the most frequent etiological factor. Often, however, the causal factor is not evident.

The diagnosis is readily established. The yellow discoloration of the skin and of the conjunctivæ, together with the urinary signs, will make the diagnosis.

Since simple jaundice is apt to assume the malignant type, the prognosis must always be guarded. Further, the great tendency of the affection to cause abortion adds to the danger which the woman runs.

The indications for treatment are the same as in case of the affection irrespective of pregnancy. In case of simple icterus the indication for the induction of abortion rarely will exist, since, as far as the woman is concerned, she is apt to recover if the affection does not assume the malignant type. As regards the child, if born during an attack of jaundice at all severe, it will rarely survive.

The transition of a simple icterus into the malignant form is gradual and usually manifests itself by rise of temperature, this being absent in case of simple icterus. Cerebral symptoms rapidly develop, such as headache, difficulty in speech, delirium. The course of the disease is rapid toward a fatal termination in a few days. The treatment can be simply symptomatic. It avails nothing to empty the uterus either in the interests of the woman or the child. Since, however, according to our belief, we are dealing with a mixed toxæmia, the preponderating factor being hæpatic insufficiency due to organic disease, much may be done to make the subject comfortable by resort to the methods which favor elimination of the toxins by Nature's channels, that is to say, by the skin, the intestines, and the kidneys. Continuous irrigation of the intestinal tract with physiological salt solution at a high temperature, will stimulate the action of each of these organs. While we doubt their efficacy, the derivatives of the bile-salts may be administered by mouth. Hot packs or the continuous hot bath assist.

The intercurrence of pneumonia or typhoid fever during pregnancy affects the course simply in that the usual symptoms of these diseases are superadded to the normal symptoms of pregnancy.

Pneumonia, of course, interferes decidedly with the life of the fœtus, owing to the high-temperature rise and the interference with the oxygenation of the blood,—the result of the lung affection. Nevertheless, the position of the physician as regards the pregnancy must be passive. It will avail nothing, either for the woman or the fœtus, to induce abortion or premature labor. The probability is that one or the other will ensue spontaneously, when, of course, the woman's chances of recovery are lessened, inasmuch as, in addition to the strain of the disease, she must withstand the strain of labor. The duty of the physician in such an event is to terminate the labor as rapidly as possible in order to spare the woman protracted strain.

Typhoid fever will rarely call for active interference with the progress of gestation. The chances are, if the attack be at all severe, that the woman will miscarry; if she do not, nothing is gained by attempts to save the woman the added strain of pregnancy by emptying the uterus.

Pernicious anæmia is an affection which, fortunately, is rarely associated with pregnancy. Such women rarely conceive, and, if they do, in the event of the symptomatology becoming aggravated, the physician is called upon to empty the uterus in order to spare the woman the additional strain which she cannot bear.

## UTERINE TUMORS COMPLICATING PREGNANCY.

Fibroid tumors do not often complicate pregnancy, since, as a rule, they are associated with sterility. They may either be submucous, interstitial, or subperitoneal.

Submucous tumors rarely permit conception to occur. If it does, the uterine mucous membrane is kept in such a state of congestion that the ovum does not find a suitable soil for development. Early abortion is therefore the rule. Where the fibroid is attached to the lower uterine segment or to the cervical endometrium pregnancy may occur and may proceed to full term.

Mural or interstitial fibroids are less likely to interfere with conception or the progress of gestation. Their presence, however, may seriously complicate labor. This is especially so when they are situated in the lower uterine segment.

Subperitoneal fibroids are not likely to interfere with pregnancy except when they are situated where they can sink into the pelvis, when they cause pressure symptoms, and at the time of labor may interfere with delivery. Fibroid tumors participate in the hypertrophy incidental to pregnancy.

The diagnosis is oftentimes difficult, and when the tumor is small it may be impossible. Their presence may be entirely masked by the usual symptoms of pregnancy, and, again, the tumor may so obscure the major signs of pregnancy as to lead to error in diagnosis. In the majority of cases careful palpation will clear the diagnosis. If there be any doubt and the symptoms are at all urgent, anæsthesia should be resorted to. Vaginal and rectal examination will often enable the physician to differentiate the hard fibroid from the gravid uterus. The presence of the ordinary signs of pregnancy should render the physician very circumspect in inserting the sound into the uterus in order to reach a differential diagnosis. If the fibroid tumor be small it will not cause any symptoms during pregnancy, neither will it often complicate delivery. It becomes a matter, however, of concern if the pelvis is contracted by the presence of a fibroid which cannot be replaced above the brim. In this event the uterus must be emptied early if the cervical canal is accessible. If the uterine cavity is not accessible, then, pregnancy being well advanced, suprapubic hysterectomy is called for. The mere destruction of the fœtus without the removal of it will almost necessarily entail septicæmia, which jeopardizes the woman's life fully as much as an hysterectomy. In the event of the woman having reached term the simple Cæsarean section will not suffice, but the Porro must be superadded. Post-partum hæmorrhage and necrotic changes in the tumor are likely to ensue if the uterus be not removed. Even in the early months of pregnancy, where the tumor is of such a size and in such location as to interfere with delivery at term by the natural passages, hysterectomy should be advocated early instead of waiting until term in the hope of saving the fœtus. The extra development of the pelvic blood-vessels will subject the woman to too much risk at term in order to save a fœtus whose life is, at best, exceedingly problematical.

Submucous tumors which appear in the vagina should be removed at any stage of pregnancy, either by torsion or by cutting, after splitting the capsule where necessary.

Cancer of the uterus, if primary in the body, necessarily precludes the occurrence of conception. Carcinoma of the cervix does not interfere with conception. Even when the disease is well advanced and necrotic changes have taken place, certain women have conceived. The disease rapidly spreads on the supervention of pregnancy, as would be expected when we remember the increased hyperæmia which follows pregnancy. In case the disease is in its early stage gestation may not be interfered with. Where the disease has invaded the deeper structures of the cervix early abortion is the rule. Hæmorrhage is of frequent occurrence not only because of the necrotic process in the diseased area, but also as the result of the normal uterine growth and expansion. The hæmorrhage may be profuse enough to jeopardize the woman's life.

In the early months of pregnancy, if the disease is limited to the cervix, hysterectomy should be performed, since early operation offers a chance of prolonging the woman's life, and the slight chance of saving the fœtus by temporizing deprives the woman of this chance of cure through early operation. The disease rapidly progresses during pregnancy, and, even though the woman should go to term and be delivered of a live child, her chances from operative interference have simply been lessened through temporizing in the interest of the fœtus. In case the disease has extended beyond the cervix, then, the woman's life being doomed, only the interests of the fœtus should be considered and the attempt should be made to conduct the woman to term. In case the cervix and the vagina are so involved as to render dilatation impossible, or if it be probable that the dilatation will result in such hæmorrhage as to imperil the chances of the child, then the Cæsarean section should be elected.

Ovarian tumors are not uncommon complications of pregnancy. Abortion is not frequent unless the tumor, by reason of its location and the presence of adhesions, prevents the normal development of the uterus.

The ovarian cyst is usually excited to increased growth by the supervention of pregnancy. As the tumor increases in size a low-grade peritonitis may ensue, or else the pressure symptoms of pregnancy are greatly aggravated. Necrotic changes may occur in the cyst, from twisting of its pedicle or from direct pressure from the gravid uterus. The position of the tumor in the pelvis may preclude delivery unless operation be resorted to.

Unless the tumor be of a fair size its presence may be unrecognized. Where pregnancy has advanced to about the sixth month it may prove an exceedingly difficult matter to reach the differential diagnosis. If the cyst cannot be differentiated and yet the case is evidently complicated by something beyond pregnancy, or if the question of pregnancy has not been settled, then it is wise to resort to anæsthesia.

As soon as an ovarian cyst is diagnosticated it should be removed, irrespective of the presence of pregnancy. If the adhesions be slight it is perfectly feasible to perform ovariotomy without interrupting the course of gestation; but, aside from this, if the cyst be not removed, the woman is subject to the risk of twisting of the pedicle, with consequent necrosis and sepsis, as, also, to that of the occurrence of peritonitis. In case the woman is too debilitated, when the diagnosis is reached, to permit of removal, then, as a temporary expedient, it may be punctured, which will relieve certain of the pressure symptoms. Whenever possible, the vagina should be selected as the site for puncture, under, of course, absolute asepsis.

Small tumors presenting in the vagina and impacted should be punctured if not recognized until about term, since this procedure is preferable to spontaneous rupture during delivery.

It is very exceptional that in women of good health and antecedents there occur psychical disturbances during pregnancy. Melancholia to a greater or a less degree is not infrequent. Much may be done by firm conduct on the part of the physician to lessen the anxious fears of the woman, and yet, in a proportion of the cases, the melancholia deepens, and it will become a question of the induction of abortion or of premature labor, in order to prevent the development of insanity of, possibly, a permanent type. (Fig. 1, Plate V.) Young women illegitimately pregnant are peculiarly prone to deep melancholia, particularly in the better walks of life. In the event of the melancholia deepening, then, always after consultation, it may seem advisable to empty the uterus. It goes without saying that the greatest care is requisite not to be deceived by a simulated melancholia. The cunning of woman illegitimately pregnant should always be remembered. She will attempt to persuade her physician by every possible means into emptying the uterus.

The peculiar pigmentation of the skin, which is associated with pregnancy in many women, calls for reference. The term "chloasma of pregnancy" has been applied to it, and, in aggravated cases, it alters the woman greatly. (Fig. 2, Plate V.) The pigmentation may assume the appearance of a mask, whence the popular term. Chloasma is apt to complicate lactation rather than pregnancy, but when it is an associate of this latter condition it will probably simply be intensified by lactation. As a rule, the woman may be assured that it will disappear spontaneously when the sexual system has recovered from the demands of pregnancy.

## DISEASES OF THE MEMBRANES AND PLACENTA.

We pass now to the consideration of affections of the membranes and the placenta, the occurrence of which alters pregnancy from the normal to the pathological. At the outset it is to be remembered that, primarily, the majority of such affections are intimately linked with diseased states of the woman. Syphilis,

PLATE V.

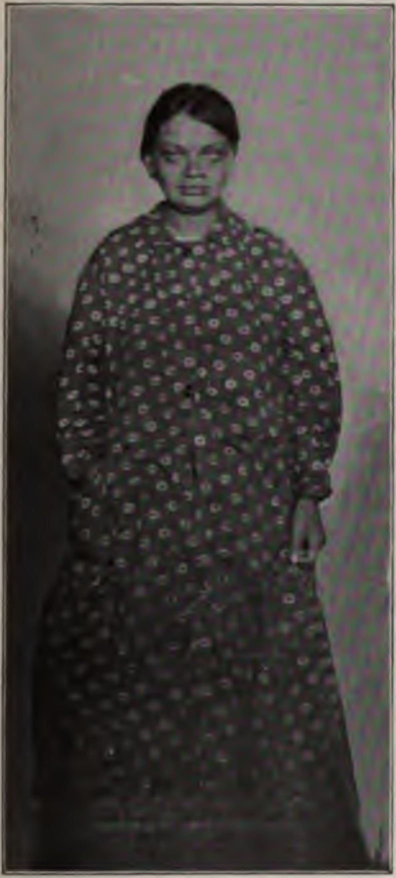


*Fig. 1.—Melancholia Complicating Pregnancy.*

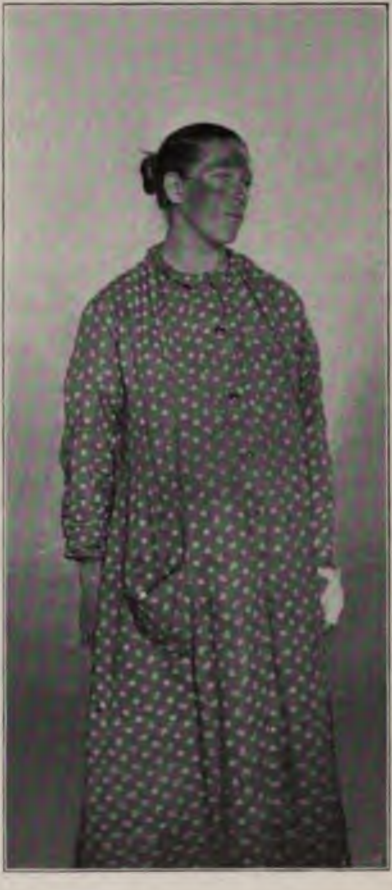


*Fig. 2.—Chloasma of Pregnancy.*

for example, is an etiological factor of moment, as also disease of the interior of the uterus. Even an endometritis of light grade, antedating conception, renders the soil unfit for the proper development of the ovum, and, if the result be not abortion or premature labor, the effect is interference with certain of the phenomena of labor, as is amply dwelt upon later.

Disease of the decidua is apt to follow on an existing endometritis, or it may develop as the sequence of an acute intercurrent disease of the woman during the course of pregnancy. Thus, in the course of cholera, or scarlet fever, and the like, inflammatory changes may set in in the decidual lining of the uterus and thence spread to the placenta and the membranes. As regards the membranes, we thus may witness the development of a diffused inflammatory form of endometritis or else a degeneration resulting in what is termed "hydrorrhœa of pregnancy." As a rule, where inflammation of the decidua is not followed by miscarriage, no especial alteration in the phenomena of pregnancy is noticed, but difficulty occurs after the birth of the fœtus when the membranes are not shed under the natural efforts, owing to the morbid adhesions which have formed. In case of so-called hydrorrhœa of pregnancy the water may collect either between the decidua vera and reflexa, or between decidua and chorion, or between chorion and amnion. Whatever the case, the diagnosis is difficult, being made by the appearance at intervals of a discharge of water in greater or less amount from the uterus. In the few recorded cases the ejection of the water was associated with painful uterine contractions. The affection has but little import, seeing that it does not interfere with the progress of pregnancy or with the development of the fœtus. Of far greater import are the diseases of the placenta, since these lead to alterations in the progress of pregnancy and affect often the vitality of the fœtus.

Inflammation of the placenta is of chief import, owing to the changes which take place in the fœtal portion, leading to alterations in the chorion which affect pregnancy unfavorably. It will be remembered that the maternal surface of the placenta is formed from the decidua serotina and that the fœtal surface is formed by the villi of the chorion. The net result of changes in the maternal surface of the placenta may be hæmorrhage, the so-called apoplexy of the placenta, or calcareous degeneration at one part or in whole, or fatty degeneration. The phenomena are exaggerated according to the extent of the lesion. When extensive, the result is abortion or premature labor, or, if the pregnancy nevertheless progress to term, the shedding of the placenta and of the membranes is interfered with, owing to the morbid adhesions which have formed.

We may note, also, either atrophy or hypertrophy of the placenta, the effect of which on the course of gestation and on the life of the fœtus varies according as the processes are local or general. The prime etiological factor in most instances of affection of the placenta is syphilis, although alterations in the vascular system, the accompaniment of renal lesion, also are followed by the same result.

Diagnosis of these changes in the placenta is hardly possible until after delivery, when, frequently, careful microscopical examination will be requisite. The effect of the changes on the course of pregnancy is simply to interrupt it at one or another stage, where the changes are extensive.

A concomitant result is the formation of what are termed "moles." These moles are known as fleshy or else they result in the formation of hydatids, leading to what is known as hydatid degeneration of the chorion. The latter would seem to be dependent on a dropsy of the chorionic villi, although the matter is in dispute. The prime etiological factor is probably an endometritis antedating conception.

Cystic degeneration of the chorion is rather unusual in occurrence. Its presence is based on the following symptomatology:—

Rapid development of the abdomen not corresponding with the period of gestation which the woman thinks she has attained. Recurring hæmorrhages. At times, if the blood lost be examined, it will be found to contain a number of hydatids. Frequently, the sole symptom up to the later months of pregnancy will be the exaggerated size of the abdomen. This will render the woman exceedingly uncomfortable, owing to the pressure symptoms, but the abdominal increase may lead only to the assumption that there exists multiple pregnancy. As a rule, however, it is the occurrence of repeated hæmorrhages which excites the concern of the woman and of her attendant, but this may mean, as will shortly be noted, vicious insertion of the placenta. Whether the occurrence of cystic degeneration of the chorion has led to early fœtal death or not, the usual signs of pregnancy are present except that, in the latter event, fœtal movements will not be appreciated; but this is not a diagnostic factor of value, seeing that not infrequently in normal pregnancy these motions are not appreciated.

The prognosis both for the woman and the child is grave. Not infrequently the woman succumbs to profuse hæmorrhage before the diagnosis is established with sufficient exactitude to enable the physician to feel justified in actively interfering. The cardinal rule for treatment, therefore, is not to temporize with hæmorrhage associated with pregnancy, for, even though this be dependent on vicious insertion of the placenta, and not on the development of a mole, the indication is the same,—to empty the uterus by as speedy a method as is consistent with the integrity of the maternal parts. Temporizing will avail the fœtus nothing, and the next hæmorrhage may be profuse enough to cast the woman into a condition of acute anæmia, if it does not kill her.

The history of these cases is one of malignancy, as shown by the rapid growth, the discharges, and the emaciation. In short, in view of these deductions, we cannot empty the uterus too early. The prolongations of the cystically degenerated chorion may insinuate themselves into the uterine wall causing, as has been recorded, perforation of the viscus, and, since many instances of choriona malignum have been preceded by some form of molar pregnancy—especially the cystic type—sarcoma results, in time becoming most malignant. (*Vide* topic of "Choriona Malignum.")

The method of procedure for emptying the uterus is described in "Obstetric Surgery." The uterus having been dilated, the entire hand should be inserted into the vagina and the fingers should clean out the interior of the organ. (Plate VI.) This manipulation is always preferable to the endeavor to curette the uterus. This instrument is liable to clean the organ only in part, and, then again, in advanced cases the uterine walls may be thin and perforation is likely to occur. The finger or fingers may, as a rule, explore the entire interior of the uterus, provided the organ be depressed by the external hand. Hæmorrhage during these manipulations is apt to be profuse, and therefore there is need of haste, and, when need be, the organ should be thoroughly tamponaded with gauze in order to check loss of blood which the woman, in probably a reduced state, cannot stand. It goes without saying that the most scrupulous asepsis should be associated with these manipulations.

## Choriona Malignum.

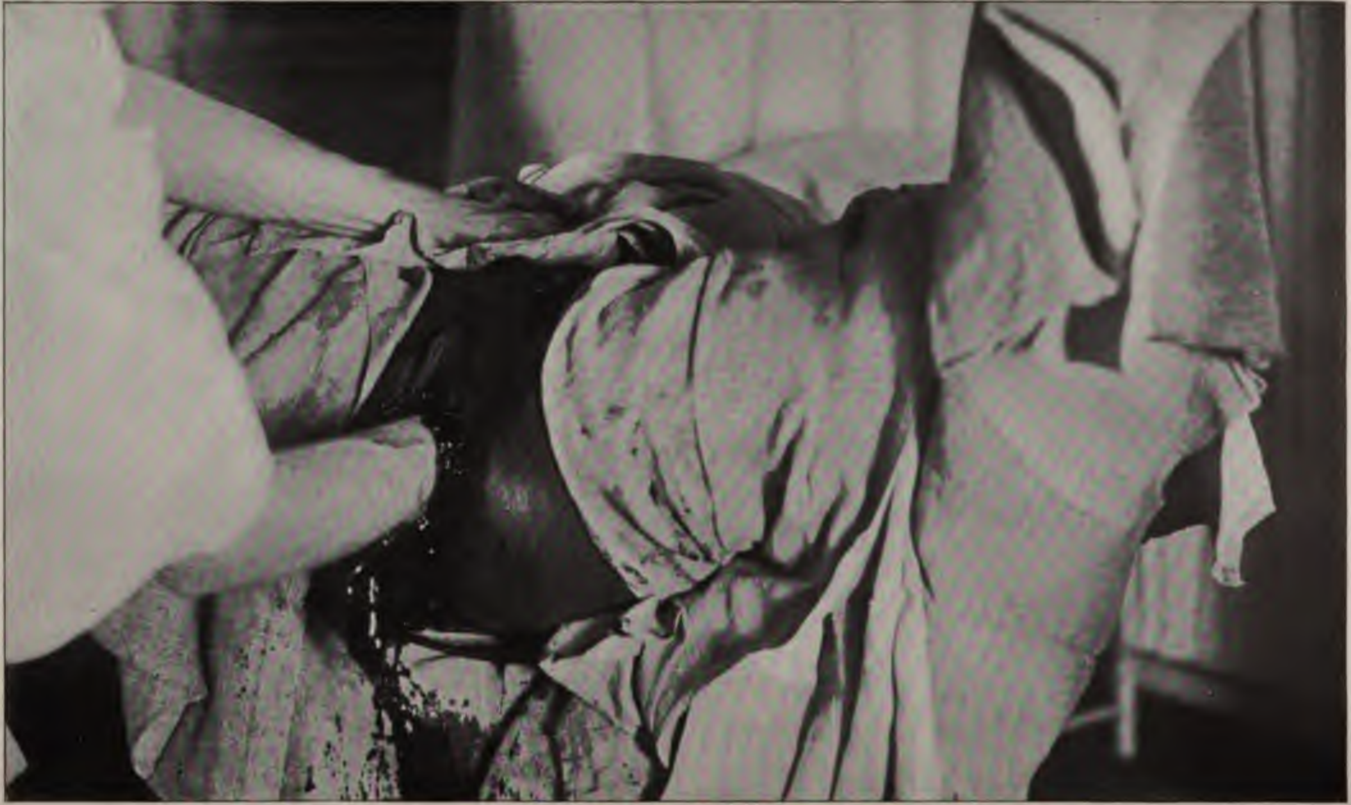
We prefer this name to the various titles used by others, for the reason that we believe the malignant process arises primarily from the fœtal secundines, although we grant that the origin of this type of sarcoma is still in doubt. It is, further, open to question whether the tumor masses are of the epithelial type—simulating, microscopically, carcinoma, or a true sarcoma, as shown microscopically by groups of small round cells. Its origin is chiefly from the villi of the chorion and, in part, from maternal decidua. It arises, therefore, from the ectodermal elements of Langhaus cells, and, to a lesser degree, from the syncytium of the chorionic villi.

*Symptomatology.*—The symptoms are those characteristic of any malignant growth.

*Termination.*—The tendency is toward death, with characteristic metastases in the lungs, and often in the vulva.

*Therapeusis.*—Early hysterectomy, preferably suprapubically, since thus more of the broad ligaments may be removed. The earlier the operation, the better the prognosis.

PLATE VI.



*Manual Removal of the Placenta.*

### HYDRAMNION.

The most important affection of the amnion is dropsy, or hydramnion.

Hydramnion consists in the accumulation of the liquor amnii in exaggerated amount in the amniotic sac. Within limits the amount of liquor amnii is very variable; so that it is difficult to differentiate the normal from the pathological. Enormous accumulations are exceedingly rare. As a rule the accumulation is gradual, and it is only in instances where the liquor reaccumulates rapidly that the symptomatology of pregnancy is markedly affected.

As the source of the liquor amnii is unsettled, even so is the etiological factor or factors at the bottom of hydramnion a matter of theory. Whether it be of fœtal origin or of maternal is in dispute, and probably the safe opinion to hold to-day is that both fœtus and woman are factors. The frequency with which hydramnion occurs in syphilitic women has been noted, and yet the affection not uncommonly develops in instances where there can be found no trace of syphilitic infection.

Dropsy of the amnion is a frequent complication of twin pregnancy, and in instances where the affection exists to an exaggerated degree the fœtuses are apt to be malformed. The occurrence of dropsy of the amnion, again, is not infrequent in repeated conceptions and is a common cause relatively of repeated abortion. As a rule, the affection does not show itself until about the sixth month of gestation. The nausea and the vomiting of early pregnancy is apt to persist and the woman is feeble and with a tendency to emaciation. Abdominal pain is a marked factor, the associate of the rapid stretching of the abdominal walls, in part, and also of uterine origin, the result of undue distension of the organ before its muscular structure has reached that stage of development which admits of such distension. Shortly, the abdomen rapidly develops in size, associated with a marked thinning of the uterine walls and great fluctuation. In consequence of this rapid development of the abdomen, pressure symptoms become exaggerated and œdema of the abdominal wall and of the extremities sets in. In extreme cases, fortunately rare, the woman becomes emaciated to an extreme degree; she cannot retain food, and hectic fever appears. The pains in the abdomen are almost constant, shooting down the thighs and interfering with rest. If nature do not interfere by the occurrence of spontaneous labor the physician must, in order to give the woman a chance for life. The uterus, however, in these extreme cases has lost contractile power, and it is exceptional that nature is able alone to empty it. This accomplished, uterine retractility is absent, and the physician must be prepared to tampon against profuse hæmorrhage.

The prognosis for the child is gloomy. It may be expelled from the uterus dead or else it lives for only a few days.

Such is the course of aggravated cases. Fortunately, as a rule, the condition does not take on an aggravated type, and passes unrecognized until labor sets in, when the enormous amount of water discharged makes the diagnosis. Even here the prognosis for the child is gloomy. The sudden discharge of the liquor amnii is apt to be associated with prolapse of the cord, and this should be borne in mind in order that the physician may resort to means for replacing the cord or for terminating delivery rapidly in the interest of the child whenever the condition of the maternal parts will permit.

In acute or in exaggerated cases it will not be a question of measures for saving the child, since ordinarily the child is dead if it be not shed prematurely; the question will be purely that of the woman's life. If the membranes do not rupture spontaneously it will be wise to rupture them artificially, high up in order to avoid the rapid emptying of the uterus, which might lead to syncope. The further course of action should depend on the condition of the woman. If it be not unfavorable, then it is wise to await the natural efforts, remaining in attendance in order to interfere actively should nature show herself unable to complete the task. The lack of contractile power in the uterus may perhaps be re-enforced by the administration of quinine by the mouth or the rectum in large doses, such as 20 grains by the mouth or 40 grains by the rectum. Often this and other measures will, however, be of no avail, and, instead of allowing the woman to pass into a state of exhaustion from the ineffectual, nagging pains, the physician should resort to such measures for emptying the uterus as are consistent with the least damage to the maternal parts. Where the cervical canal is soft and dilatable the elective accouchement described in "Obstetric Surgery" will answer admirably. In any event, it should be remembered that there is danger of uterine atony, and therefore the physician should be prepared to tampon the uterus with sterile gauze in case of hæmorrhage after delivery.

Death of the fœtus prior to the occurrence of term—indeed, at any stage of gestation—may be the associate of any of the lesions of the placenta or the membranes on which we have laid stress. It by no means follows, however, that the uterus will attempt to expel the dead fœtus. For months it may be retained, and, so long as the membranes are unruptured and sources of infection do not gain access to it, it may remain *in utero.* At times the liquor amnii is absorbed and the fœtus becomes mummified before it is shed. Again, the fœtus may slowly become macerated.

The alteration in the signs of pregnancy due to fœtal death are slow. For a time the abdomen may increase in size and the other subjective and objective symptoms may continue. This will account for instances where the dead fœtus has been shed not developed to the degree called for by the stage of gestation. As a rule, however, the abdomen gradually decreases in size, the breasts diminish in size, secreting actively for a few days, and then the milk disappears, as well as the other signs of pregnancy, if they have offered at all.

The health of the woman is only apt to be affected if she become infected and the fœtus decompose, in which event, on the recognition of the fact, the duty of the physician is to empty the uterus as soon as is feasible without inflicting unnecessary injury on the maternal parts.

## Vicious Insertion of the Placenta.

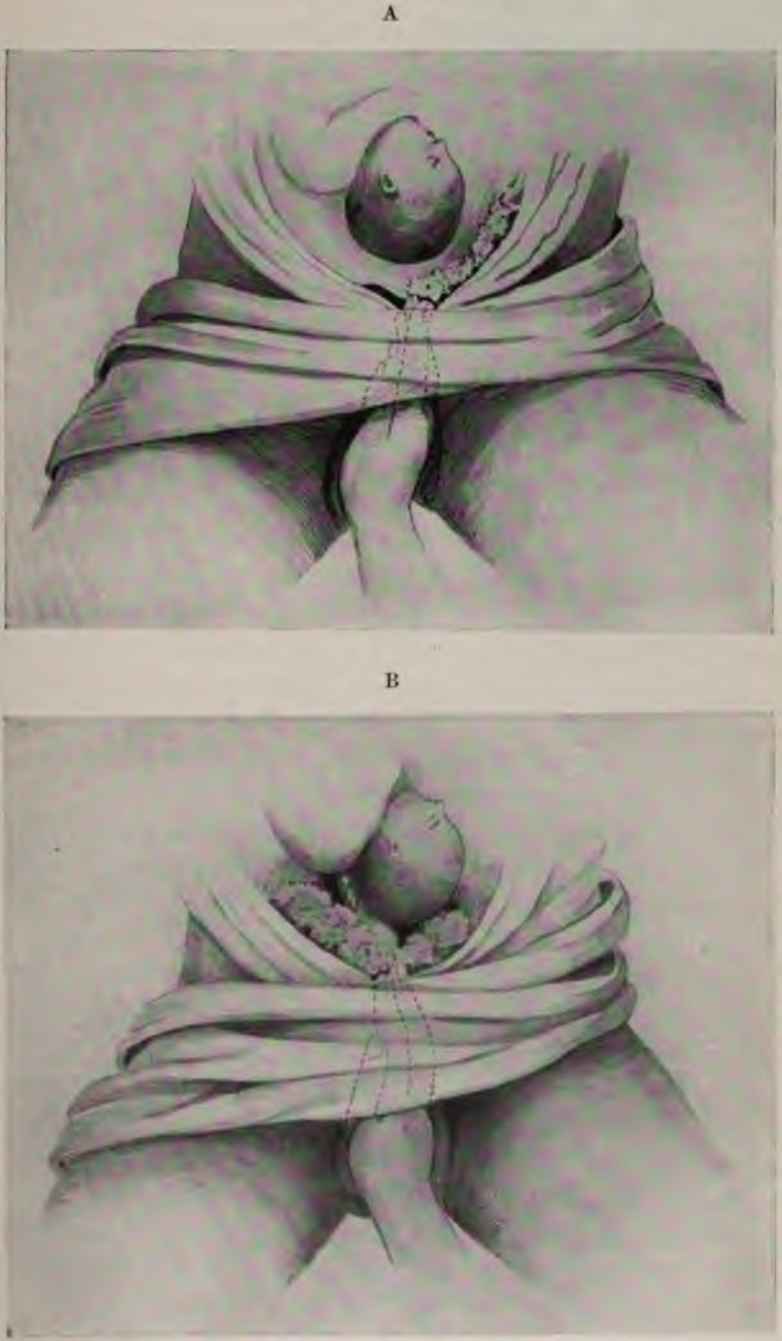
We have purposely left for final consideration vicious insertion of the placenta. This is not a disease, properly so called, complicating pregnancy, and yet its occurrence impresses gestation after a fashion which renders it markedly pathological. On prompt recognition the life of the woman will often depend, to say nothing of the fact that vicious insertion of the placenta very frequently entails fœtal death.

Under normal conditions the placenta is implanted at the fundus of the uterus or to one or the other side, and may there develop without altering the physiological course of gestation. Further, when the placenta is implanted after the normal fashion the development of the uterus, in particular the changes in its lower segment, may progress without there being any interference with the growth of the placenta. The uterine mucous membrane when in a normal condition offers proper soil for the development of the ovum at any point. In case the ovum ingrafts itself at the lower zone of the uterus, or in case during the early weeks of gestation it becomes dislodged and obtains a second attachment in the lower zone of the uterus, then we have present a vicious attachment of the placenta.

Two varieties of attachment of the placenta out of the normal may occur. It may become attached and develop just above the level of the internal os or else it may become implanted over the internal os. The former is known as a marginal attachment and the latter as a central attachment. The symptomatology and the prognosis and the course of action will vary according as one or the other of these vicious insertions occur.

Marginal attachment of the placenta is not likely to give rise to symptoms until the gestation has advanced to about seven and one-half months, since, until this date of gestation has been attained, changes do not occur in the lower uterine zone which infringe on the site of placental growth. In case of central attachment, on the other hand, symptoms occur at an earlier date, since the de-

## *PLATE VII.*



*A. Marginal Placenta Prævia* *B. Complete Placenta Prævia.*

velopment of the lower uterine segment of the uterus of necessity puts on the stretch the entire circumference above the level of the internal os. As the muscular fibres of the uterus increase in size, and as the uterus spreads in every direction in the course of development, it stands to reason that if the placenta does not concomitantly develop certain of its attachments are bound to yield, and thus we have the prime and the initial symptom of the vicious attachment, namely, hæmorrhage. Obviously, also, this hæmorrhage will be profuse or not, according to the degree of separation, and such separation must always be greater when the insertion is central than when it is marginal, and also earlier in occurrence. This is the reason why we have repeatedly laid stress on the fact that hæmorrhage occurring during the course of pregnancy should always be a matter of grave concern. It should always suggest the possibility of vicious insertion of the placenta, and, as will be noted, as soon as the diagnosis is established with a fair show of reason, there is but one possible course of treatment, whether we consider the woman alone, as is the case in early gestation, or both the woman and the child, as will hold in advanced gestation.

The diagnosis is not always easy, particularly in early gestation, before it is possible for the examining finger to penetrate the cervix and to reach high enough up to feel the presenting placenta. Here the diagnosis will often remain in doubt until after the uterus has been emptied and the placenta is examined. In early pregnancy—that is to say, prior to the sixth month—we shall have to proceed by a process of exclusion. Thus, we must rule out cervical polyp as a cause of hæmorrhage, and also partial separation of the placenta. Cervical polyp will be detected by touch in case it be large enough to cause sufficient hæmorrhage to justify the name. Partial separation of the placenta is apt to be associated with but slight oozing, and, if this should recur in any amount, the indication for treatment is the same as if the diagnosis of vicious implantation of the placenta had been reached. In the event of the hæmorrhage recurring prior to the seventh month of gestation, then, even though it is not possible to feel the vicious insertion, the rule will be to take steps to empty the uterus. Often, before it is possible to insert the finger into the cervical canal, the increased development of the lower uterine segment to one or the other side and the additional pulsation in this neighborhood over that which is normal will excite the suspicion of the physician. As soon as it is possible for the examining finger to penetrate through the cervix the diagnosis will be made in case of central implantation, since the finger will reach the soft, boggy, placental tissue instead of the presenting part of the fœtus. In the event of marginal attachment, the diagnosis obviously can only be certified in case it is possible to pass the finger above the internal os and to reach the lateral wall of the uterus. In case of lateral attachment, however, it is exceptional that the first hæmorrhage occurs before the seventh month of gestation, and then it is apt to be slight. The next hæmorrhage, however, may shortly follow and be more profuse; so that even in case of lateral attachment it behooves the physician to be on his guard in order to resort to the proper method of treatment before the woman has the chance to become exhausted or exsanguinated.

Hæmorrhage, then, recurring at greater or less interval, is the cardinal sign of placenta prævia. Locally, the suspicion of the physician may or may not be aroused by the abnormal enlargement and the vascularity of the lower uterine segment. The first hæmorrhage may not amount to much, but, since hæmorrhage to any degree in the course of pregnancy is abnormal, the physician should watch carefully. He may to advantage instruct his patient, after a manner which will not alarm her, that it is advisable that she should notify him in the event of there being a second flow, and that on its occurrence she should at once go to bed and remain quiet. Thus, in cases of lateral implantation, it may prove possible to tide the woman over to term, or, at any rate, to the term of fœtal viability,—about seven or seven and one-half months,—when, of course, we give the fœtus a chance of life, slender though it be. In the event of the hæmorrhage being at all profuse or where the physician is able to feel the placenta presenting, then it is unwise to temporize. A consultation should be called and steps should be taken to empty the uterus according to the method and in accordance with the line of argument which will be found in "Obstetric Surgery."

Under the method of treatment advocated in "Obstetric Surgery" the prognosis of placenta prævia has improved greatly over that which older methods of treatment gave. The elective emptying of the uterus enables us to save nearly 90 per cent. of the infants instead of losing this number, as was the record of the past, and the chances of the woman's life being saved may be placed at about 98 per cent. These statements apply strictly to instances where there is no temporizing with the tampon, or, worse than all, with ergot. The uterus is emptied, after dilatation by the hand, preceded, where need be, by incision of the cervix, or, where time permits, by preliminary gauze packing of the cervix to secure softening and dilatability, and the uterine tamponade is at once utilized in cases where the organ does not contract, the woman being thus spared loss of blood as far as is possible. The risk associated with these manipulations is simply septic infection, and therefore the corollary to proceed aseptically.

# CHAPTER IV.

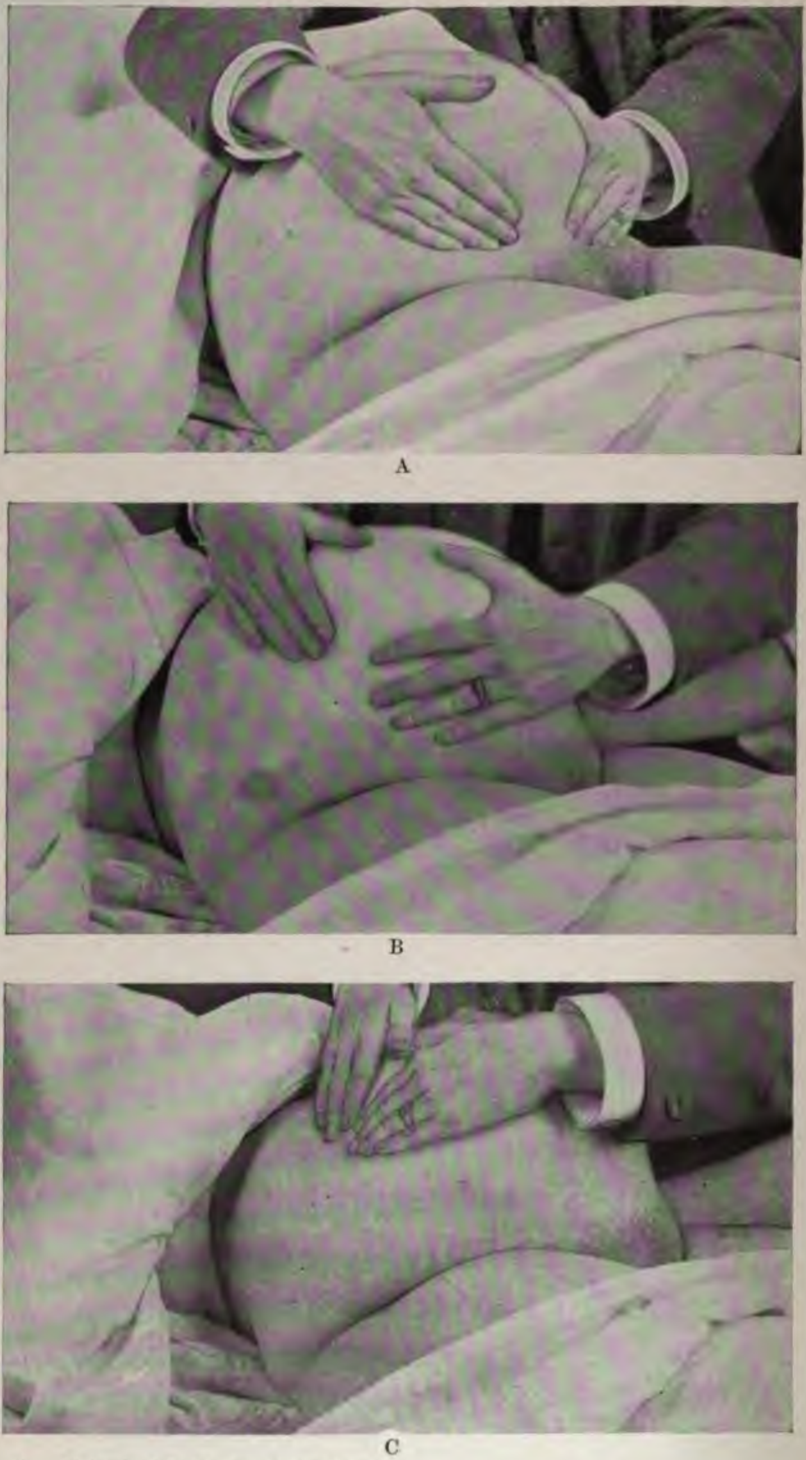
## DIAGNOSIS OF THE PRESENTATION AND OF THE POSITION OF THE FŒTUS.

A PREREQUISITE to the conduct of labor is the diagnosis of the presentation and of the position of the fœtus. This information is secured through resort to abdominal palpation associated with vaginal examination. By presentation of the fœtus is understood that portion of the fœtus which endeavors to enter the pelvic inlet. By position of the fœtus is understood the relation which certain portions of the presenting part bear to certain fixed points of the pelvis.

The longitudinal axis of the fœtus may be coincident with that of the uterus, or it may occupy the transverse diameter of the organ, or it may assume a position intermediate between. The first is normal; the latter are abnormal. By means of abdominal palpation, conjoined with vaginal examination, the different presentations and positions may be differentiated, except in instances where the abdominal walls are so fat as to interfere with palpation, when vaginal examination alone must suffice. As a general rule it may be stated that, prior to labor, only the presentation may be determined, and this through palpation. In order to differentiate position it is requisite that the cervical canal shall have opened sufficiently to enable the finger in the vagina to recognize certain landmarks on the presenting part.

To properly perform abdominal palpation the woman should lie on a bed or couch, the legs flexed on the abdomen, and the abdominal walls covered by a thin sheet. The bladder should be empty. There need be no exposure of the woman, and if the reason for examination be explained it will be exceptional that she will offer any objection; indeed, she will have a higher opinion

# PLATE VIII.



A. *Abdominal Palpation of Pelvic Brim.*
B. *Abdominal Palpation of the Dorsum of the Fœtus.*
C. *Abdominal Palpation of the Pelvic Pole of the Fœtus, the Vertex Presenting.*

of her attendant, who is evidently taking every precaution necessary for her welfare.

By means of percussion the outline of the uterus is determined and its height above the pelvic brim,—an approximate means, as has been noted, of determining the probable period of gestation. The flattened hands are then made to traverse the uterine tumor with the end in view of determining the direction in which the uterus is enlarged. Marked increase in the transverse diameter of the uterus will suggest that the fœtus occupies this diameter chiefly, in which event the fœtal poles, on deep palpation, will be found above the iliac crests, one above and the other below the line drawn through the centre of the uterine tumor transversely. The woman should be counseled to breathe quietly and to resist the effort to contract the abdominal muscles. The tips of the examining fingers may thus be insinuated deeply and a greater sense of resistance will be met with at one or the other side of the uterine tumor. To the touch the sensation may be one of greater hardness and the outline may be rather spherical. The inference is that the fœtal head is being palpated. If this portion be struck sharply it will ordinarily be felt to rebound from the fingers, giving the abdominal ballottement. In case the abdominal walls be thin and the gestation has advanced to about the seventh month, the palpating fingers may trace out the outline of the fœtus from this harder surface along the dorsum to the breech and may reach the fœtal small parts, usually the feet. The dorsum of the fœtus, being harder than the anterior aspect and being applied closer to the uterine walls, always yields the sensation of greater hardness. The evidence thus obtained of transverse or oblique position of the fœtus as regards the uterine axis may now be corroborated by palpation of the pelvic brim. (Plate VIII, A.) The fingers of one or of both hands are applied just above the pubes and pressed downward as far as is possible. If the poles of the fœtus occupy the transverse diameter of the uterus they will not be found at the pelvic inlet unless there be multiple pregnancy, in which event corroborative evidence must be sought. In case of doubt as to whether the pelvic inlet or the space just over it be occupied or not, resort to vaginal examination will clear the diagnosis. Where the fœtus is presenting by its longitudinal axis coincident with that of the uterus, examination by the vagina will reveal the fœtal pole resting on the lower uterine segment. If this segment be not occupied and the external palpation has revealed the transverse axis of the uterus occupied by the poles of the fœtus, the inference is clear that we are dealing with a transverse presentation of the fœtus. This presentation may be directly transverse or oblique. In the former event the poles of the fœtus will be coincident with the transverse axis of the uterus; in the latter event the poles will be found just above one or the other iliac crest. Auscultation will assist in reaching a correct estimation of the position of the fœtus. Where the position is transverse, the beat of the fœtal heart will be heard above or below the umbilicus in the midline, according to the position of the dorsum of the fœtus.

The information of the transverse or the oblique presentation of the fœtus thus acquired is especially valuable, since, if detected before rupture of the membranes and in the presence of sufficient liquor amnii to allow of the procedure, external manipulation will enable us to convert it into the more favorable one of presentation of the vertex, according to the method described under "Version" in the portion of this work dealing with obstetric surgery.

The transverse or oblique presentation of the fœtus is an unfavorable one for the occurrence of normal labor, and, whenever detected, the proper efforts should be made toward converting it into the favorable one of presentation of the cephalic pole or even of the pelvic pole; that is to say, where the long axis of the fœtus corresponds to the longitudinal axis of the uterus. Under these conditions the shape of the uterine tumor is more that of a flattened sphere, the transverse diameter of the uterus not being enlarged out of proportion to the longitudinal. On palpating there will be a distinct sense of greater resistance along one side of the uterus than on the other, corresponding to the dorsum of the fœtus. (Plate VIII, B.) This sense of greater resistance is noticeable mainly when the dorsum of the fœtus is applied to the anterior parietes of the uterus. When the dorsum of the fœtus is posterior the resistance will not be felt except on deep palpation, but instead the small parts of the fœtus, usually the feet, may be palpated with greater or less ease, according to the amount of adipose in the abdominal walls and the quantity of liquor amnii. The dorsum of the fœtus having been determined, by following the outline upward a hard, roundish body or a denser body not so regular in outline will be detected,—in the first instance the head and in the second the breech of the fœtus. (Plate VIII, C.) If the liquor amnii be present in normal amount and the presenting part be not fixed in the pelvic brim, impulse on this part will result in the determination of abdominal ballottement. The fingers next proceed to palpate above the pubes. The bladder having been emptied, the fingers are inserted deeply above the pubes, and either a hard, spherical body is determined or else a rounder, softer mass,—in the first case the head of the fœtus, in the second the breech. If the head of the fœtus be felt just above the pelvic brim, then, by following the outline of the dorsum, the position of the breech may be readily determined; if the breech be detected above the brim, then the head will be recognized at the opposite pole. The breech can never engage prior to labor, and will, therefore, always be found above the pelvic excavation. The head of the fœtus, on the other hand, may enter the pelvic brim just prior to or at the time of labor, unless there be disproportion between the head and the pelvic inlet. By means of vaginal examination the data secured by abdominal palpation may be certified. In case the long axis of the fœtus corresponds with the longitudinal axis of the uterus, on vaginal examination either the hard head will be found in the lower uterine segment or the softer breech. In the event of the membranes not having ruptured and there being a sufficiency of liquor amnii, the presentation may be further certified by the obtaining of vaginal ballottement.

The attitude of the fœtus may be neither transverse nor longitudinal, but oblique. In this event conjoined abdomino-vaginal examination will aid in diagnosis of presentation. The finger being in the vagina, the fingers of the other hand palpate the space above the pubes, when to one or the other side a round body, hard to the touch, will be detected,—the head,—or a softer body less determinate in outline,—the breech. If there be a sufficiency of liquor amnii, these parts of the fœtus, by conjoined manipulation, may be brought over the pelvic inlet.

The following presentations of the fœtus may be recognized, and it is important to differentiate them as accurately as possible: Presentation of the vertex; presentation of the brow or face; presentation of the breech, complete or incomplete; presentation of the trunk.

Under the subject of "Normal Labor" we will note in detail the manner after which these various presentations may be recognized through vaginal touch. In this place the endeavor is simply to determine what information may be secured through abdominal palpation at the stage of pregnancy when the fœtal presenting part is not accurately palpable through the vagina, owing to the closure of the cervical canal.

It is essential to recall here what may be termed the obstetrical landmarks of the fœtus, since on the knowledge of these will depend the ability of the physician to differentiate presentation and variety of position.

The fœtus lies in the uterus inclosed in its membranes in an attitude of flexion. In such attitude it best accommodates itself to the dimensions of the uterine cavity so as to occupy the least possible space. The trunk is flexed; the chin is applied to the sternum; the legs are flexed on the abdomen and the arms on the thorax. This leaves a free space between the upper and the lower extremities, and here the umbilical cord lies,—where it is the least subject to pressure. The shape thus assumed by the fœtus is that of an ovoid, the pelvic extremity forming the larger and the cephalic extremity the smaller end. Various theories have been advanced to explain the assumption of this attitude by the fœtus, but the most rational is that which looks upon it as simply the exaggeration of the primal curva-

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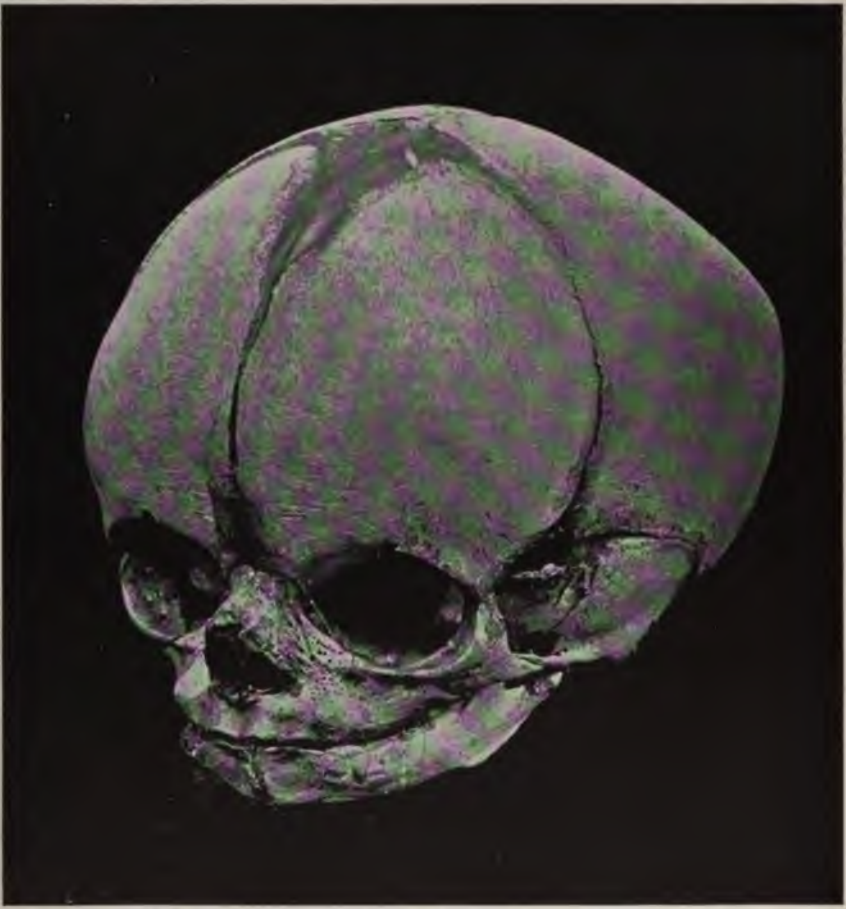
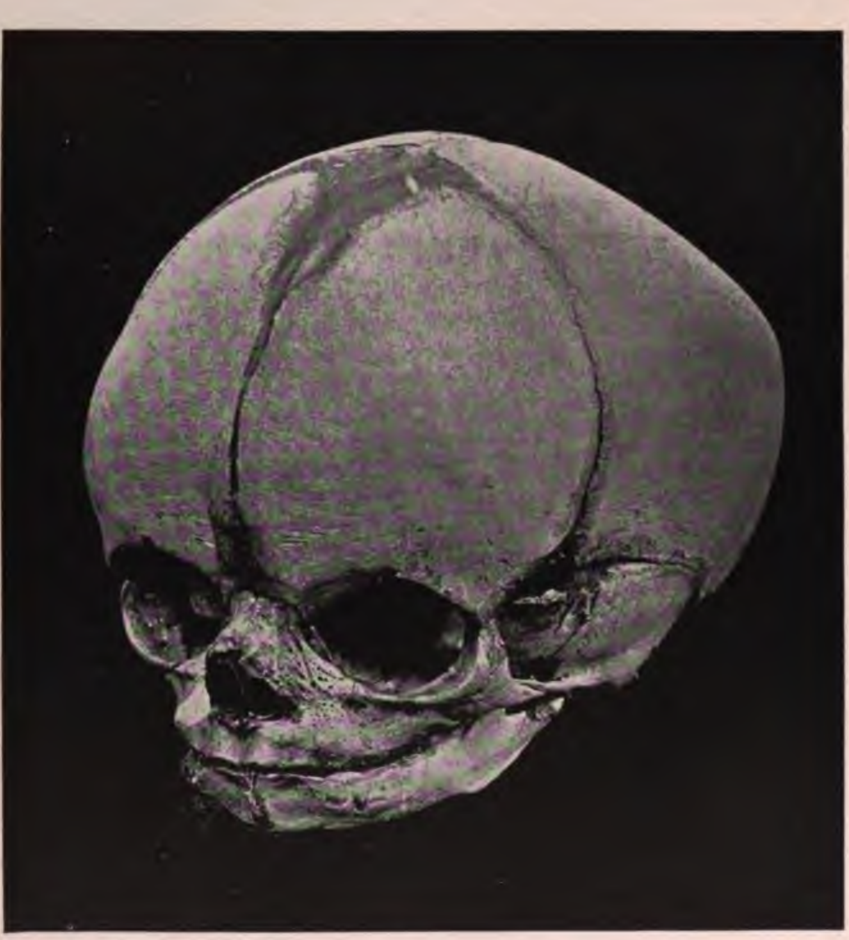
PLATE IX.



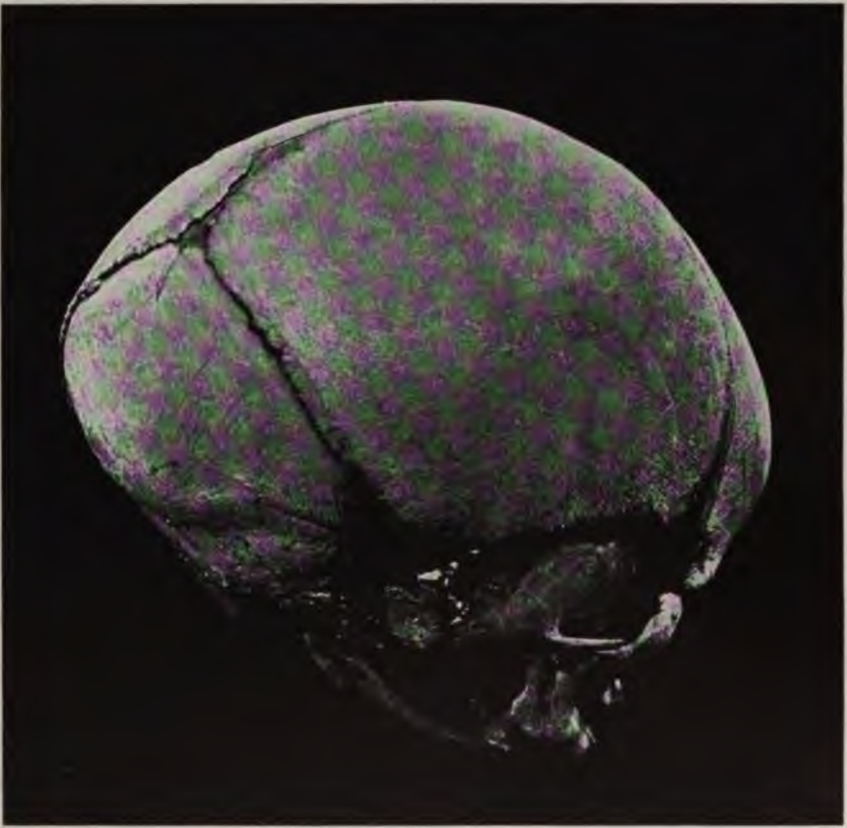
*Front View of the Fœtal Skull (showing the Anterior Fontanelle and the Coronal and Frontal Sutures).*

PLATE IX.



*Front View of the Fœtal Skull (showing the Anterior Fontanelle and the Coronal and Frontal Sutures).*

*PLATE XI.*



*Posterior View of the Fœtal Skull (showing the Posterior Fontanelle and the Lambdoidal and Sagittal Sutures).*

ture which exists in earliest embryonal life. In the vast proportion of instances the cephalic extremity of the fœtus is the lowest in the uterus, and such presentation is looked upon as the normal. It must be remembered, however, that, owing to the natural motility of the fœtus, it may assume any position prior to engagement of the presenting part in the pelvis. The advantage derived from early abdominal palpation, therefore, is the possibility of recognizing what are regarded as unfavorable presentations and of rectifying them into the favorable.

The fœtal head at term is ovoid in shape, its larger extremity being posterior. The bones which enter into the structure of the skull are separated by the sutures and the fontanelles. These dividing portions are of especial interest to the obstetrician, since it is through the recognition of them by vaginal touch that he is in a position to accurately picture the portion of the cephalic extremity which is presenting,—a matter which will be fully elucidated later. The fontanelles, of value from an obstetrical stand-point, are the anterior and posterior. (Plates IX, X, and XI.) The anterior fontanelle is larger than the posterior, is quadrangular in shape, and is formed by the separation of the parietal from the frontal bones. This separation is affected by means of the frontal, the coronal, and the sagittal sutures. The anterior angle of this fontanelle is formed by the separation of the two halves of the frontal bone; the posterior angle is formed by the union of the parietals. The borders of the fontanelle are formed by the frontal and parietal bones. The quadrangular shape of the greater fontanelle and the fact that each angle may be traced into a suture enable the physician to differentiate this fontanelle, and, in consequence, he is in a position to determine which portion of the vertex is presenting or has engaged.

The posterior fontanelle is placed where the sagittal and lambdoid sutures unite. It is always much smaller than the anterior fontanelle, and in shape it is triangular. These angles are formed by the occipital and parietal bones.

The recognition of these fontanelles is facilitated by remembering the course of the sutures which separate the bones of the fœtal head. The sutures are four in number. The frontal suture runs between the two halves of the frontal bone. The coronal suture separates the parietals from the frontal bone. The sagittal suture extends from the frontal suture to the point where the lambdoid suture forms its apex, and crosses the coronal suture. The lambdoid suture lies between the occipital bone and the posterior borders of the parietals. These are the sutures which enter into the composition of the fœtal head and which are of importance to the physician in his capacity of accoucheur. Like the fontanelles, these sutures are of utility in determining the position of the fœtal head only after the pregnancy has advanced to that stage when the examining finger can reach the head directly through the open cervix. The sutures and the fontanelles constitute the essential obstetrical landmarks, so to speak, of the fœtal skull, but their presence in the head must be remembered in endeavoring to change position by external examination, since it is by adapting certain portions of the head to the pelvic inlet by external manipulation that we are frequently enabled to convert an unfavorable position into a favorable.

On external manipulation, the bladder having been emptied, and the abdomen of the woman being covered by a thin sheet, the palpating fingers inserted above the pubes as deeply as possible may be able—under circumstances when deep palpation is not impossible, owing to great amount of adipose in the abdominal wall or excessive amount of liquor amnii—to differentiate the hard, oval occiput from the flatter brow of the fœtus. Having determined the presentation of the occiput, just above or just below the pubes, it is a comparatively simple matter to follow out the outline of the dorsum of the fœtus along one or the other uterine wall to the upper extremity of the fœtus or the breech. Further, the presence of a sense of greater or less resistance to one or the other side of the midpubic line will enable the physician to determine whether the occiput points toward the right side or the left side of the woman,—a matter of importance, as will be noted later on in the discussion of the subject of "Labor." Absence of marked resistance above the pubes and coincident absence of a sense of greater resistance on one side of the uterus over the other also give us valuable information, in that the inference is sound that the dorsum of the fœtus lies in the posterior segment of the uterus and that either the brow or the face of the fœtus is presenting,—unfavorable presentations, as will be seen.

When, on palpation above the pubes, we do not find the fœtal head, but instead the larger, softer, more irregular outline of the breech, we are enabled—through deep palpation—to determine whether the dorsum of the fœtus is anterior or is posterior. In the one case the breech may be readily palpated in outline; in the other, the anterior face of the fœtus being applied to the uterine walls in front, we shall on palpation only be able to detect an indistinct sense of resistance above the pubes, and, following along laterally to one side or the other, we shall feel the fœtal feet or knees, except where the abdominal walls are very fat or there is an excessive amount of liquor amnii.

We have noticed that the fœtus presents either by the cephalic pole, or by the pelvic, or transversely. Under the subject of "The Mechanism of Labor" these presentations will be considered in detail. Seeing that it is important to recognize as accurately as possible the variety of presentation during pregnancy in order to alter a disadvantageous into an advantageous position, it is proper to study here in outline the main facts bearing on the subject. When the head of the fœtus presents, flexed, at the pelvic brim, we have what is known as presentation of the vertex. When the head of the fœtus presents, extended, at the brim of the pelvis, we have a presentation of the face.

The pelvic extremity may appear at the brim completely flexed, the thighs being closely applied to the abdomen and the heels resting on the nates, in which case we have a complete presentation of the pelvic extremity. The thighs and the legs may be completely extended along the ventral surface of the fœtus, in which case we have a presentation of the breech. When the thighs are flexed on the pelvis and the legs on the thighs we have a presentation of the knees. When both thighs and legs are extended we have a presentation of the feet. In case of transverse presentation,—presentation of the trunk,—either one or the other shoulder presents at the pelvic brim.

When these varieties of presentation descend vertically into the pelvis the presentation is known as regular. When, however, the descent is inclined we have varieties of each presentation. Thus, of the cephalic extremity, we have an occipital, a frontal, and a parietal presentation, according as the occiput or the frontal or the parietal bone is over the centre of the pelvic inlet. Similarly, in case of the pelvic extremity, we may have pubic, iliac, or sacral varieties of presentation. Of the trunk, we may have costal, abdominal, cervical, or dorsal.

During the course of labor, as will be noted, these irregular presentations are apt to become regular, or, if not, it is the duty of the physician in attendance to recognize and to rectify them.

The position of the presenting part of the fœtus is again, for purposes of study,—and, indeed, of practical import,—divided according as certain points of the fœtal presenting part are related to certain fixed points in the maternal pelvis.

In practice the obstetrical landmark for presentation of the vertex is the occiput; and, for presentation of the face, the forehead, or, preferably, the chin. In case of the pelvic extremity whether the presentation be complete or incomplete, the sacrum is selected as the landmark; for the knees the anterior surface of the tibia; and, for the feet, the heel or calcaneum. In case of trunk presentation, since the shoulder presents at the brim, the acromion has been selected as the landmark.

By bearing these specific landmarks in mind the physician, when he makes his local examination during labor, can tell which portion of the presenting part is offering, and can thence deduce the course of labor or of action. These are points which will be amply considered under the proper heading.

As regards the pelvis, practically it must be remembered that the presenting part of the fœtus may be turned toward any portion, but in the vast proportion of cases either the presenting part at the brim of the pelvis occupies one oblique diameter or the other. The pelvis, therefore, has been divided into two symmetrical halves,—a right iliac region and a left iliac region. The presenting part of the fœtus must occupy one or the other of these halves, and, according to the case, one or another given term is applied. Thus, in case of presentation of the vertex, the occiput is either in the left oblique diameter of the pelvic brim or in the right oblique. It may occupy a position intermediate between, but then we have simply the presenting landmark in the transverse diameter, either to the right or the left.

The diameters of the pelvis are the antero-posterior, the oblique, and the transverse. The presenting part of the fœtus always occupies at the brim either the oblique or the transverse diameter of the pelvis. The pelvic obstetrical landmarks are therefore selected in these diameters; and in the oblique diameter the ilio-pectineal eminence and the sacro-iliac synchondrosis, left or right, are taken as the extremities, and the centres of the ilium are taken as the extremities of the transverse diameters. Now, according as the prominent fœtal landmark in a given case points toward one or another of the extremities of these diameters the position is denominated after one or another manner.

Where the vertex of the fœtus presents, the occiput lies in the left or in the right iliac region and points either toward the right or the left pectineal eminence or toward the right or the left sacro-iliac synchondrosis. Therefore, we recognize the following varieties of presentation of the vertex:—

Occiput to the left, pointing toward the left ilio-pectineal line; occiput to the left, pointing to the left sacro-iliac synchondrosis; occiput to the right, pointing to the right ilio-pectineal line; occiput to the right, pointing to the right sacro-iliac synchondrosis.

In case of the face, the anatomical landmark being the chin, we recognize varieties of presentation according to whether the chin points to one or the other of these pelvic landmarks:—

Chin to the left or to the right, anterior or posterior, according to the half of the pelvis, right or left, which it occupies, and according to whether it points to the right or the left pectineal eminence or to the right or the left sacro-iliac synchondrosis.

In case of the pelvic extremity, the sacrum being taken as the landmark, we speak of left or of right sacro-iliac anterior or posterior position, according to whether the breech presents in the right or the left half of the pelvis and points toward the left or the right pectineal line or sacro-iliac synchondrosis. In case of the trunk, the shoulder being taken as the landmark, we speak of the left or right anterior or posterior position of the shoulder, according as it presents in the right or the left half of the pelvis and points toward the left or the right ilio-pectineal line or the right or the left sacro-iliac synchondrosis.

In practice these varieties of presentation are denominated thus:—

### VERTEX.

| | |
|---|---|
| L. O. A., | Left occiput anterior. |
| R. O. P., | Right occiput posterior. |
| L. O. P., | Left occiput posterior. |
| R. O. A., | Right occiput anterior. |

The intermediate positions are known as O. T. L. or O. T. R., according as the occiput points toward the centre of the left or the right ilium.

### FACE.

| | |
|---|---|
| M. L. A., | Mento-left anterior. |
| M. R. P., | Mento-right posterior. |
| M. L. P., | Mento-left posterior. |
| M. R. A., | Mento-right anterior. |

The intermediate positions are known as M. L. T. and M. R. T., according as the chin points toward the centre of the right or the left ilium.

### BREECH.

| | |
|---|---|
| S. L. A., . . . . | Sacrum left anterior. |
| S. R. P., . . . . | Sacrum right posterior. |
| S. L. P., . . . . | Sacrum left posterior. |
| S. R. A., . . . . | Sacrum right anterior. |

Only in case of exceptionally large pelvis or very small child can the sacrum point toward the middle of one or another ilium; so that practically such positions need not be taken into account.

### TRUNK.

Presentations of the trunk are differentiated according as the right or the left shoulder points toward the right or the left sacro-iliac synchrondrosis, the dorsum being anterior or posterior. In practice it makes no difference, since we are dealing with a presentation which cannot be delivered by nature short of the occurrence of what is termed spontaneous evolution, but always requires otherwise the interference of the physician. These presentations and the method of dealing with them will be fully discussed under the subject of " The Management of Abnormal Labor."

The presentations and the positions which we have considered not uncommonly alter during pregnancy and frequently during labor. During pregnancy, where the liquor amnii is present in normal amount, the fœtus is capable of considerable motion prior to engagement of the presenting part; and during labor, under the influence of the uterine contractions and in obedience to the configuration of the pelvis, the presenting part changes in position, usually, fortunately, after a fashion which best favors delivery. After an understanding of the mechanism of labor the student will be in a position to appreciate the reasons for these changes and the effect they have on the course of labor.

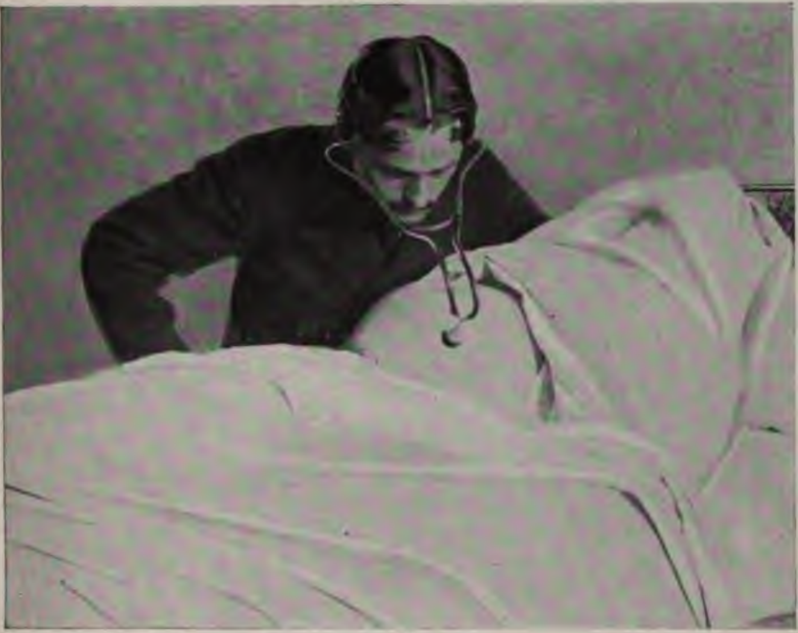
A further aid, and a very valuable one where the conditions are favorable for diagnosticating the presentation and the position of the fœtus, is yielded us by auscultation. The fœtal heart is situated nearer the cephalic extremity than the pelvic. As we have noted, the posture of the fœtus in the uterus is one of anterior flexion, and therefore the sounds of the fœtal heart are best transmitted through the back of the fœtus. Where the fœtus is presenting by the cephalic extremity, the fœtal heart-sounds must necessarily be heard with greatest intensity below a line which divides the uterus about its middle portion. In case the pelvic extremity is presenting, the heart-sounds will be heard above this line. In practice, therefore, when the fœtal heart is heard below the umbilicus the inference is safe that the presentation is one of the cephalic extremity, and the reverse holds true for the pelvic extremity.

A convenient way of remembering where to listen for the fœtal heart under different presentations and positions is the following: Imagine the uterus divided by a line drawn vertically through it and passing through the umbilicus. Bisect this line by a second at the umbilicus. This divides the abdomen into four equal quarters. In one or another of these divisions the fœtal heart will be heard with maximum intensity, according as the presentation is of one or the other variety. Thus, as will be further elucidated under the subject of the "Mechanism of Labor": In case of presentations of the vertex the heart-sounds will be heard in the left or in the right lower segments, according as the back of the fœtus occupies the left or the right segment of the uterus. (Plate XII, A and B.) In case of breech presentations the heart will be heard in the left or the right superior segments, according as the back of the fœtus lies in the left or the right segment of the uterus.

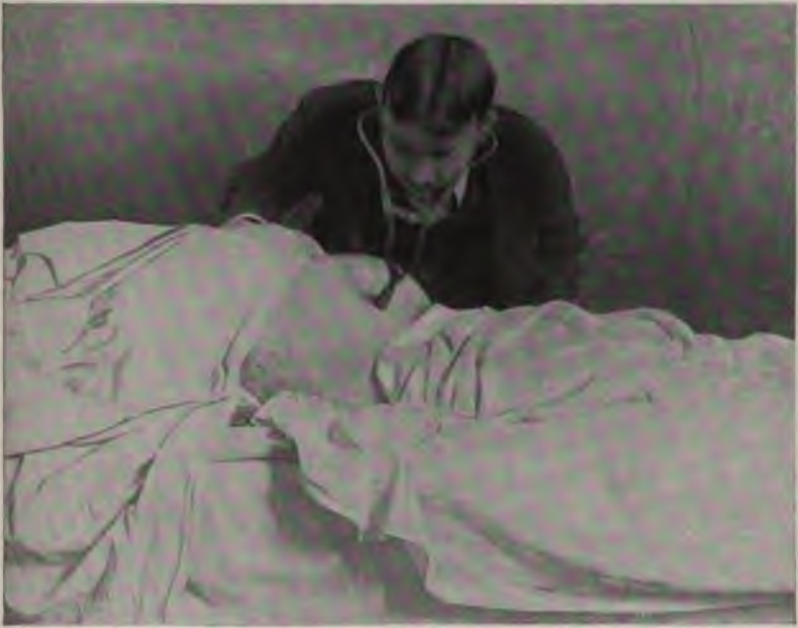
For the vertex we seek the heart-sounds along a line connecting the umbilicus and the left or the right anterior superior spine, according as the position is left or right anterior. In case of posterior positions of the vertex the maximum intensity is posterior to these lines. (Plate XIII, A.)

In case of the breech the heart-sounds are heard where the positions are anterior, to the left or the right of a line extending through the centre of the umbilicus to the centre of the last rib. The sounds are discernible behind these lines to the left or the right, according as the position is left or right posterior. (Plate XIII, B.)

PLATE XII.



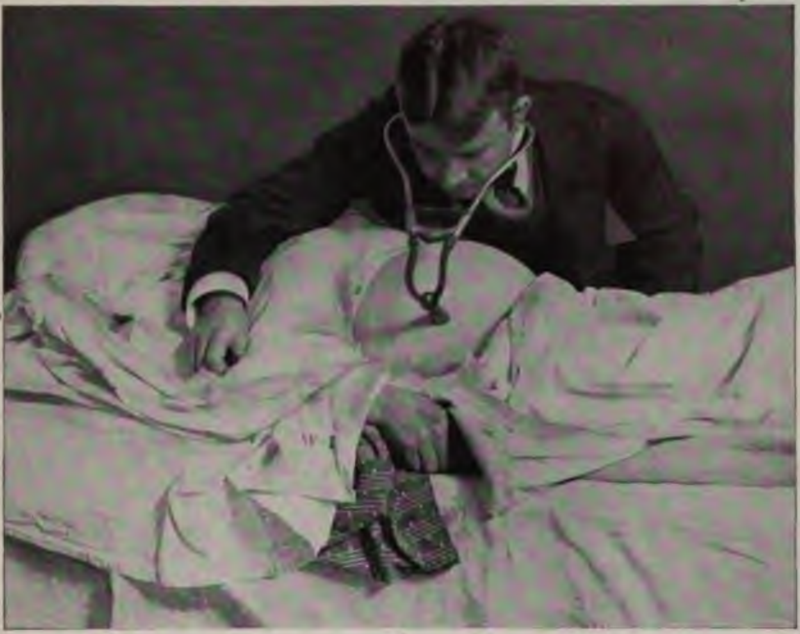
A



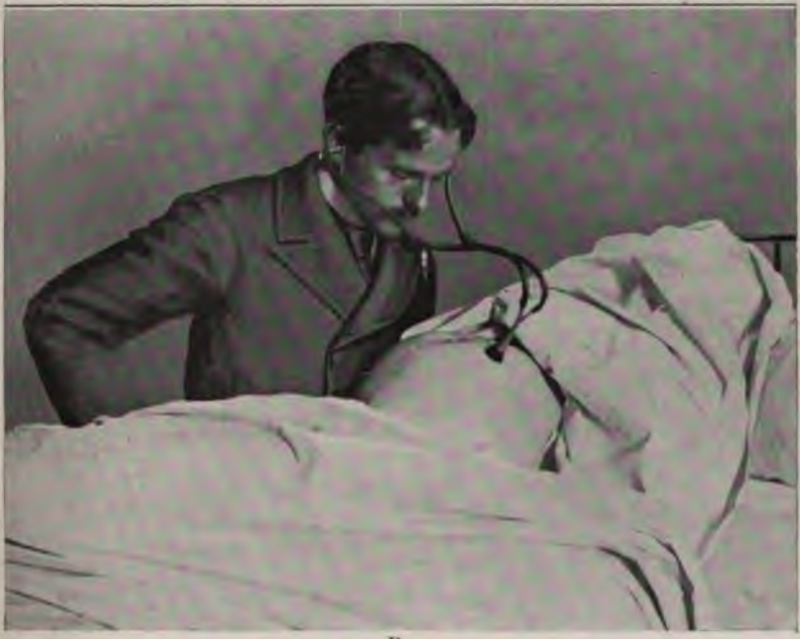
B

*A. Site of Maximum Intensity of the Fœtal Heart-sounds in Presentation of the Vertex. Position, Left Occiput Anterior.*

*B. Site of Maximum Intensity of the Fœtal Heart-sounds in Presentation of the Vertex. Position, Right Occiput Anterior.*



A



B

*A. Site of Maximum Intensity of the Fœtal Heart-sounds in Presentation of the Vertex. Position, Right Occiput Posterior.*

*B. Site of Maximum Intensity of the Fœtal Heart-sounds in Presentation of the Breech. Position, Left Sacro-anterior.*

In case of presentations of the face the heart-sounds are heard with maximum intensity in the same localities as in case of presentation of the vertex.

In case of transverse presentations, where the dorsum of the fœtus is anterior, the point of maximum intensity is apt to be below the umbilicus, near a line drawn transversely through it to the left or the right, according as the head of the fœtus is to the left or the right.

Of subsidiary importance in the diagnosis of position is the point where the woman usually feels the movements of the fœtus in the given case. These movements are often due to motion of the small parts, in particular the feet, at times direct impact being felt. When the occiput is to the woman's left side motion will often be felt to the greatest extent in the right upper uterine segment, where the feet are, and *vice versâ.* In case of presentation of the pelvic extremity, motion due to movement of the feet will be appreciated by the woman below the umbilicus to the left or to the right, according as the breech is to the woman's left or right.

Information thus acquired carries by itself but very little weight, but may be utilized as corroborative of information in regard to presentation acquired through palpation and auscultation.

In case of multiple pregnancy, the hearing of two or more fœtal hearts differing in rhythm and of different intensity at different parts of the abdomen, particularly if these sounds are heard by independent observers, will lead to the strong presumption that there exists more than one fœtus.

# PART II.—Labor.

MECHANISM OF LABOR.

THE CLINICAL COURSE OF LABOR.

MANAGEMENT OF NORMAL AND ABNORMAL LABOR.

CARE OF THE NEWBORN INFANT.

# CHAPTER V.

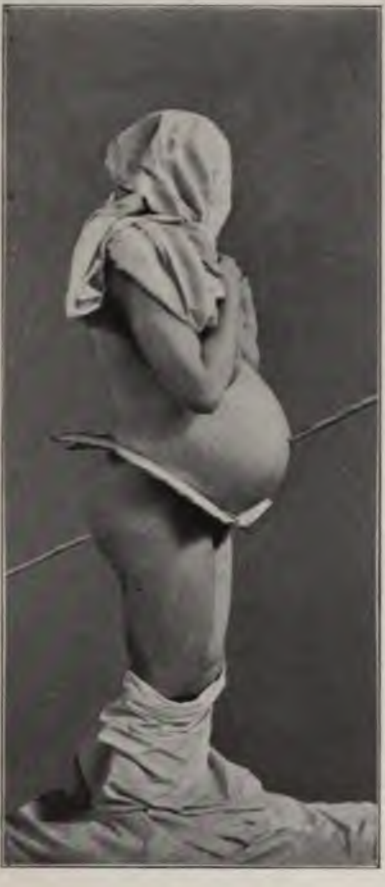
## MECHANISM OF LABOR.

A THOROUGH understanding of the mechanical phenomena of labor must precede the study of its course and its management. Labor may be defined as the effort of certain expelling forces to overcome certain resisting forces. The chief expelling force is furnished by the uterus. The resisting forces which constitute the obstacle to be overcome are offered by the pelvis and its floor and by the fœtus,—the body which it is the aim of the uterus to drive into the world. In great part labor is the result of muscular contraction and of muscular relaxation. One set of muscles contract and relax (the uterine) and another set yield or relax (those of the pelvis and of the pelvic floor). Furthermore, the shape of the fœtus and the amount of compressibility it is amenable to must be considered, for were it not for certain movements which it executes the fœtal body could not be made to adapt itself to the mechanical forces by which it is gradually propelled along the pelvic canal and thence out of the pelvic outlet.

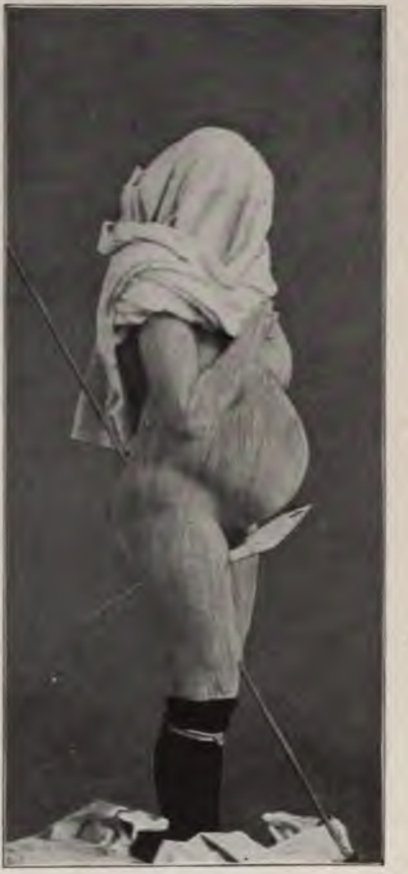
As we have noted, the fœtus at term lies in the uterus, under normal conditions, in a state of flexion, surrounded by its membranous envelopes and floating in a greater or less amount of water, which subserves the double purpose of acting, through the membranes, as a dilating wedge and also of protecting the fœtus from injury from the application of a direct muscular power to its surface. During the course of pregnancy coincident with the growth of the fœtus the uterus not only enlarges in bulk, but also in each individual muscular fibre; so that, at term, we have a body which, properly re-enforced by the action of the abdominal muscles, is, under normal conditions, competent to drive its contents down through the pelvic canal and out into the world. We have seen that during the whole course of pregnancy the uterine muscle alternately contracts and relaxes. As pregnancy approaches nearer to term these intermittent contractions become more appreciable and recur at more frequent intervals, until, finally, they merge, as it were, and, under their influence, the lower uterine segment opens at the cervix and the fœtus is allowed to descend toward the pelvic outlet. These contractions of the uterus are strictly involuntary, and they constitute the efficient cause of labor. When the uterus has expended its force and has succeeded in opening the way through its cervix, then the abdominal muscles are called into play and assist in completing delivery. The effect of the contractions on the uterus is to harden it, whereby it alters both in shape and in position. The transverse diameter of the organ becomes shorter and its antero-posterior longer; it approaches nearer the anterior abdominal wall. During the period of relaxation the uterus returns to its previous shape and consistency. These periods of relaxation are necessary in order that the circulatory process may not be interfered with, and in order to enable the muscular fibres to regain tone. Were the contractions continuous the result would be spasm of the muscular fibre instead of relaxation. During each contraction the contents of the uterus are driven downward, the result being that the water in which the fœtus floats forms a wedge at the lowest portion of the membranes, and this wedge assists in forcing the muscle of the lower uterine segment to relax. As the uterine contractions increase in frequency and in duration, the total result is the gradual opening of the cervix, whereby the fœtus is enabled to enter the vagina. It is then that the abdominal muscles are called into play. The contractions cease to be involuntary. The woman must help herself through expulsory effort. The involuntary contractions of the uterus having opened up the cervix, the resistance to be overcome now is that offered by the walls of the pelvis and the pelvic floor, in addition to that offered by the fœtus itself, which must be made to adapt itself to the shape and the dimensions of the canal through which it must pass.

The canal through which the fœtus must pass is formed by the pelvis and the pelvic floor. The pelvis is divided, from an obstetri-

*PLATE XIV*



*The Plane and the Axis of the Superior Strait, or Pelvic Inlet.*



*The Plane and the Axis of the Inferior Strait, or Pelvic Outlet.*

cal stand-point, into a superior and an inferior portion. The superior portion of the pelvis constitutes what is termed the pelvic inlet, and, except where it is deformed to a considerable degree, it does not interfere with the passage of the child. The dividing line between the superior and the inferior pelvis is the linea ilio-pectinea.

In order to appreciate the mechanism of labor we must study the characteristics of these portions of the obstetric pelvis, chiefly what are known as its straits and its planes:—

### STRAITS OF THE OBSTETRICAL PELVIS.

There are two straits,—the superior, or that of the inlet, and the inferior, or that of the outlet.

The superior strait is oval in shape, and when the woman is in the erect posture its plane is an oblique one, the direction being from behind forward and from above downward. It follows that the axis of the pelvic inlet is not in a line with the abdominal cavity, the inclination of the plane of this strait being about sixty degrees. The axis of the superior strait being a line perpendicular to the centre of its plane, if prolonged upward and forward it will emerge in the abdominal wall at a point a trifle below the umbilicus, and, if prolonged downward and backward it meets the anterior face of the coccyx about midway from the tip of the organ. The importance of remembering the direction of this axis is obvious, since, in order to enter the pelvis the fœtus must accommodate itself to this line of the pelvic inlet. (Plate XIV.)

The circumference of the superior strait varies, within normal limits, between thirteen and sixteen inches. There are three diameters of obstetrical import: The antero-posterior, or sacro-pubic, extending from the upper edge of the pubic symphysis to the centre of the sacro-vertebral angle, and measuring, on the average, four and one-half inches. The transverse diameter, extending from the centre of the innominate line of the one side to that of the other, and measuring about five inches. The right and the left oblique diameters, extending from the pectineal eminence of each side to the sacro-iliac synchondrosis, and measuring from four and one-half to four and three-fourths inches.

The inferior strait is formed by two triangles, the common base of which is the line uniting the ischiadic tuberosities. The apex of the anterior triangle is at the tip of the coccyx. The circumference of the inferior strait is uneven, which is owed to the projection of the coccyx and the tuberosities of the ischium and the depressions formed by the pubic arch and the edges of the greater sacro-sciatic ligaments.

The plane of the inferior strait extends from the tip of the coccyx to the subpubic point. It is only in labor that this plane assumes importance, and then it alters owing to the recession of the coccyx under the pressure of the fœtal head. When the woman is in the recumbent posture, as she is apt to be in labor, the inclination of this plane is from above downward and from in front backward. The axis of the inferior strait, when prolonged upward and forward, meets the axis of the superior strait at the centre of the pelvic cavity, and, if it be prolonged beyond, will end at the sacro-vertebral junction or a trifle above this point. When prolonged backward and downward the axis of the inferior strait meets the pelvic floor just anterior to the anus. When a woman is in the dorso-recumbent position the axis points almost directly forward. (Plate XIV.)

In the normal pelvis the diameters of the inferior strait measure about four inches, but during labor, owing to the recession of the coccyx and the yielding of the sacro-sciatic ligaments, there is a gain of about one-half inch.

Intermediate between the superior and the inferior straits lies the cavity. The fœtus, having entered the superior strait, must undergo certain changes in position and in shape in the cavity before it can engage normally at the inferior strait. The shape of the cavity of the pelvis varies greatly within normal limits, since it is dependent on the curve of the sacrum and the coccyx, and this is different in each woman. It follows, therefore, that we cannot properly speak of an axis of the pelvic cavity, for we are not dealing with a straight line, but with a curvilinear. The direction which the fœtus must follow in order to reach the pelvic outlet is a curved one. We may define the axis of the cavity as being a curved line passing through the centre of the true pelvis, at all parts being equidistant from the sacrum and the pubes. Along this line, from inlet to outlet, the fœtus passes in order to enter the world.

The diameters of the cavity, with their average measurements, are: The antero-posterior, which extends from the middle of the posterior surface of the symphysis to the junction of the second and third sacral bones, and which measures, on the average, about four and one-half inches; the transverse diameter, which extends from about the middle of each side of the cavity, crossing the antero-posterior at a right angle and measuring about four and one-half inches; the two oblique diameters, which extend from the centres of the great sciatic foramina to the posterior face of the subpubic grooves on each side and measure about four and one-half inches.

The fœtus, having entered the superior strait and engaged in the cavity, meets with resistance at the pelvic floor, which it must overcome in order to emerge at the pelvic outlet.

It will be remembered that the pelvic floor is richly supplied with fascia which interlaces the muscular structure, giving this floor great resistance as well as great distensible power. The muscles, which are of importance from an obstetrical stand-point, are few in number and are conjoined in a central raphé, so that the pelvic floor can yield to applied pressure not alone laterally, but also from before backward, as is essential in order to allow the fœtal presenting part to emerge at the outlet of the pelvis. These muscles are, in brief, the following: The levator ani, the constrictor vaginæ, the ischio-coccygeus, and the ischio-cavernosus. Through the relaxation of certain of the muscular fibres of these muscles and through the contraction of others, the lower pelvic diaphragm is enabled to open in order to give exit to the fœtal presenting part.

These muscles and the fascia are pierced by three openings,—the anal, the vulvar, and the urethral. The muscles we have noted not only clothe the pelvic floor, as it were, but they also surround, in a measure, each of these openings, acting both as constrictors and relaxors. It is important to remember the points of attachment and of origin of these muscles, and they are as follow: The levator ani and the ischio-coccygeus is a double symmetrical muscle, attached in front, on the internal surface of the body of the pubes, close to the symphysis, to the posterior surface of the horizontal rami of the pubes, to the ischiatic spine, and to the anterior surface of the lesser sciatic ligament. From these attachments the fibres radiate to a central fibrous raphé which extends from the coccyx to the rectum, being attached to the lateral walls of the rectum, to the lateral walls of the vagina, and to those of the bladder. The fibres passing from the sciatic spine and the sciatic ligament to the coccyx constitute the ischio-coccygeus muscle, and form the posterior fasciculus of the levator ani.

The sphincter ani is a muscle surrounding the lower extremity of the anus, and extending from the tip of the coccyx to the posterior portion of the rectum. It encircles the rectum, the anterior fibres decussating—those from the right passing to the left, and *vice versâ*—and uniting to form the constrictor vaginæ. This muscle, the constrictor vaginæ, surrounds the urethra anteriorly and extends to the clitoris, joining the fibres of the ischio-cavernosus. The constrictor vaginæ and the sphincter ani, therefore, form a figure-of-8.

The transversus perinei consist of a pair of symmetrical muscles. They originate from the anterior surface of the ischiatic tuberosities and, passing into the space between the vulva and the anus, blend there with the sphincter ani and the constrictor vaginæ. The ischio-cavernosa are symmetrical muscles extending from the ischiatic tuberosities and the ischio-pubic rami, surrounding the root of the clitoris and merging with the upper attachment of the constrictor vaginæ.

Such, in brief, are the constituent parts of the pelvic floor. The force essential to overcome the resistance of the pelvic floor is furnished chiefly by the contractions of the abdominal muscles, aided by the bearing-down effort of the woman, whereby, of course, the intra-abdominal pressure is increased. These forces are largely dependent on the volition of the woman and are intermittent in action,—a very necessary factor, it will be noted, in order to prevent undue pressure on the pelvic floor of a continuous nature, which could but result in injury.

The pelvic floor measures, on the average, from the tip of the coccyx to the anus one inch and three-fourths, and from the anus to the vulva one-fourth of an inch. As the presenting part emerges at the pelvic outlet the relaxation and retraction of the muscles and the fascia are such as to give a measurement of about five inches from the coccyx to the posterior margin of the outlet.

Having considered the nature of the expellent forces and the resistance to be overcome which is offered by the pelvis and the pelvic floor, it remains to note the configuration, from an obstetrical point of view, of the fœtus, which must pass from the uterine cavity out at the outlet.

The fœtal head is the portion of the fœtus which presents the greatest mechanical obstacles in its passage through the pelvis, and therefore it is important to understand its configuration thoroughly. The fœtal head, in shape, is oval, being composed of the face and cranium, its larger extremity being posterior. Eight bones enter into the composition of the cranium,—the occipital, frontal, ethmoid, sphenoid, two temporals, and two parietals. The frontal bone in front, the parietal and the squamous plate of the temporal laterally, and the occipital bone posteriorly form the vault of the cranium. Its base is composed of the sphenoid, the ethmoid, the petrous portion of the temporal, and the basilar portion of the occipital bone. The bones which enter into the composition of the vault of the cranium are separated from each other by the sutures and the fontanelles. The result is that there exists not alone considerable motion between these bones, but there is room for considerable compressibility.

The sutures of obstetrical interest are the sagittal, coronal, and the lambdoidal. The sagittal extends from the middle of the coronal suture to the apex of the lambdoidal. It separates the parietal bones. The coronal suture divides the parietals from the frontal, and is intersected at its middle by the sagittal suture. The lambdoidal suture lies between the occipital bone and the posterior borders of the parietals. The extremities of this suture lie at the squamous plate of the temporal bone, and its apex is at the posterior end of the sagittal suture. As will be noted, since the head of the fœtus is subject to compression as it passes through the pelvis, these sutures project, from the sliding of the bones on one another. In this way the dimensions of the fœtal head are diminished in certain of the diameters and are increased proportionately in others. The determination of the direction of these sutures enables the examining finger to become cognizant of the portion of the fœtal head which lies in one or another part of the pelvis.

The presence of the fontanelles enables the head of the fœtus to be further compressed as it passes through the pelvis, and the recognition of one or the other fontanelle of obstetrical significance teaches that one or another portion of the head occupies one or another part of the pelvis. We distinguish the greater and the lesser fontanelle, as has been stated, and it is important to bear in mind the characteristics of each. To recapitulate: the greater fontanelle is quadrangular in shape, and is bounded by the borders of the frontal and the parietal bones. The anterior angle is formed by the separation of the halves of the frontal bone; the posterior angle is formed by the junction of the parietals; the lateral angles are formed by the divergence of the frontal from the parietal on each side. At each angle a suture terminates, and this characteristic, together with the quadrangular shape, enables the finger to readily recognize this fontanelle. The smaller and posterior fontanelle occupies the point where the sagittal and the lambdoidal sutures unite. In shape this fontanelle is triangular, the angles being formed by the parietals and the occipital bone.

The circumference and the diameters of the fœtal head are of prime importance, since on their adaptability to the pelvis depends the emergence of the fœtal head at the outlet. The importance of the diameters increases with the degree in which the configuration of the pelvis differs from the normal, as is amply exemplified in the portion of this work dealing with the surgery of obstetrics. The chief diameters of the fœtal head, with their measurements, are :—

The occipito-frontal, extending from the occipital protuberance to the root of the nose, measures about four and three-fourths inches.

The occipito-mental, extending from the occipital protuberance to the chin, measures about five and one-fourth inches.

The cervico-bregmatic, extending from the posterior border of the anterior fontanelle to a point midway between the occipital protuberance and the occipital foramen, measures three and three-fourths inches.

The fronto-mental, extending from the top of the forehead to the chin, measures three and one-fourth inches.

The suboccipito-bregmatic, extending from the occipital protuberance to the centre of the anterior fontanelle, measures three and one-fourth inches.

The biparietal, extending from one parietal protuberance to the other, measures three and three-fourths inches.

The bitemporal, extending from the centre of the temporal bone on one side to the other, measures about three inches.

The bimastoid, extending from the mastoid process of one side to that of the other, measures about three inches.

A further point about the fœtus, of interest in connection with the mechanism of labor, is the manner after which its head is articulated to the spinal column. This articulation is of such a character that when, under the influence of the uterine and abdominal contractions, the head enters the pelvis, it is in a position of flexion,—the position so necessary, as will be noted, in order that the favorable diameters of the fœtal head may become applied in the favorable diameters of the pelvis. The articulation to the spinal cord is such that the portion of the head anterior to the foramen magnum represents the long arm of a lever; in consequence, when, under normal conditions, the head enters the pelvis, the forces being equally distributed anteriorly and posteriorly, the head flexes on the sternum.

The mechanism of labor differs in detail according to the presentation, although in general the fœtus performs a series of evolutions each of which tends to facilitate its passage from the uterus through the pelvis. These movements are : flexion, descent, internal rotation, extension, external rotation or restitution, and complete delivery.

We have already noted that the attitude of the fœtus in the uterus is one of flexion, this attitude being the one under which the fœtus best accommodates itself to the capacity of the space in which it lies. Under the influence of uterine and abdominal action this flexion becomes intensified until the presenting part reaches the pelvic floor, when, in order to facilitate delivery, the fœtus undergoes the movements of rotation and of extension. Flexion and descent assist in the engagement of the presenting part in the superior strait; when the presenting part reaches the floor of the pelvis rotation occurs in order to bring the most favorable diameters of the fœtus into the most favorable diameters of the cavity and of the outlet of the pelvis. In order to emerge at the outlet the presenting part must extend to a greater or less degree in order to bring into the antero-posterior diameter of the outlet—the widest diameter—the diameters of the presenting part which can best be there accommodated. External rotation is essential in order that the portion of the fœtus yet in the pelvis may, in turn, present its most favorable diameters to those of the cavity and of the outlet of the pelvis.

Whilst, normally, the general mechanical scheme is the same for all varieties of presentations, the mechanism varies in certain respects with each position, and, therefore, it is essential to consider tersely the mechanical phenomena of each.

Because of their greater frequency, we first study the mechanism of presentations of the vertex.

The vertex may present at the superior strait in one of four positions denominated as follows : Left occiput anterior (L. O. A.), right occiput anterior (R. O. A.), left occiput posterior (L. O. P.), and right occiput posterior (R. O. P.). Prior to descent intermediate positions are possible, such as transverse, pubic, and sacral; but since, in order to descend, the vertex must assume one of the four positions noted, except where we are dealing with an abnormally large pelvis or an unusually small fœtus in relation to the given pelvis, it is only necessary to remember these positions and to study their mechanism.

*L. O. A. Position* (*Occiput to the Left and Anterior*).—The diagnosis of the position is established by palpation, auscultation, and vaginal touch.

On palpation, when the attempt is made to grasp the head at the superior strait, a greater sense of resistance is determined to the right of the midline. This is due to the fact that the forehead lies here, flexion of the chin on the sternum of necessity making the forehead more prominent here when the occiput lies to the left of the pelvis and anterior. The palpating hands will hence be able to map out a greater sense of resistance along the left anterior surface of the uterus, where the back of the fœtus lies. The small parts of the fœtus will be found occupying the right upper uterine segment.

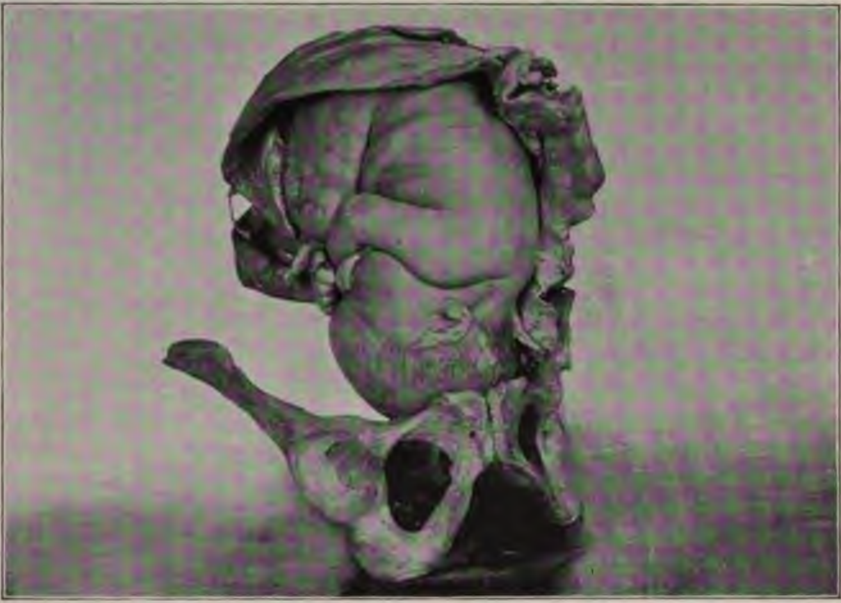
On auscultation, since the back of the fœtus is applied to the left anterior uterine segment, and since the fœtal heart occupies a position nearer the cephalic pole of the fœtus than the pelvic pole, the fœtal heart-sounds will be heard below the umbilicus in a line extending from the left anterior superior spine to the umbilicus.

Vaginal touch only yields information of value after the cervical canal has dilated sufficiently to enable the finger to reach the presenting part, and often not until the membranes have ruptured. The finger reaches the head and determines the sagittal suture. This suture is recognized by remembering that at its extremities are the fontanelles, the anterior fontanelle in the position we are now considering being found behind and to the right, and the lesser fontanelle being found in front and to the left. The sagittal suture, therefore, lies in the left oblique diameter of the pelvis, which is the diameter extending from the left ilio-pectineal eminence to the right sacro-iliac synchondrosis.

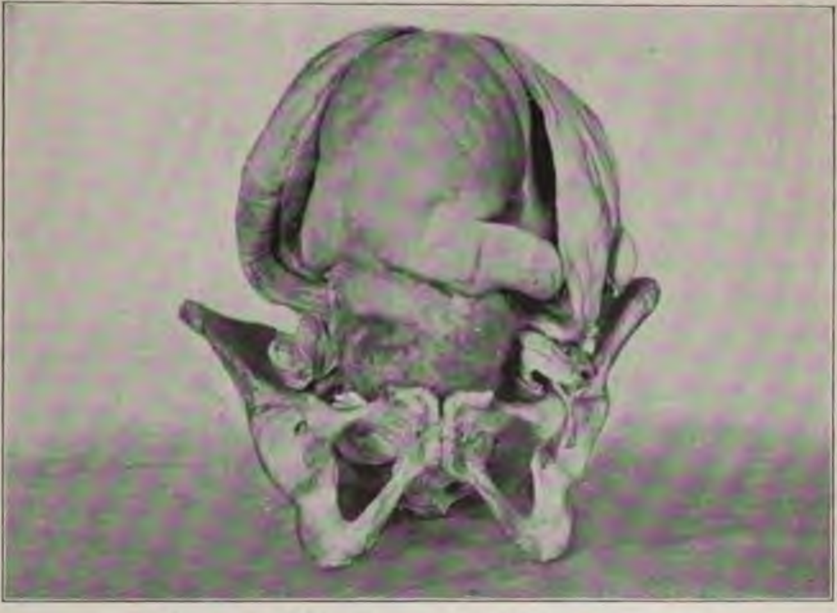
Under normal conditions the head does not become perfectly flexed until the membranes have ruptured; that is to say, descent does not begin. Under the influence of the uterine contractions the cervix opens and the fœtus is forced down into the superior strait. Flexion and descent are practically coincident, and the vertex enters the superior strait with its plane nearly coincident with that of the strait. The chin being flexed on the sternum, the sagittal suture may be traced in the left oblique diameter of the strait. The vertex thus descends to the pelvic floor. Normally, during descent, the vertex is nearly perpendicular; that is to say, the parietal eminences are in the same plane. When, however, the head enters the cavity and approaches the pelvic floor, the anterior parietal eminence—in this position the right—sinks lower than the posterior; so that this eminence, instead of the sagittal suture, will be determined in the left oblique diameter of the pelvis. When the head reaches the pelvic floor rotation occurs. The result of rotation is that the occiput is brought to the front; that is to say, the chin remaining flexed on the sternum, the round occiput glides along the left antero-lateral plane of the cavity of the pelvis until it looks toward the pubes, the forehead and the chin looking toward the sacral concavity. The cervico-bregmatic diameter of the head is thus brought into apposition with the antero-posterior diameter of the outlet; that is to say, a measurement of about three and one-half inches is applied to one about four and one-half. The biparietal diameter occupies the transverse of the pelvis, or a measurement of about three and one-half inches is opposed to one about four and one-fourth inches. It will be noticed that the head rotates into this favorable position for the reason that further descent is impossible otherwise, and, since the occiput has all along pointed to the left and anteriorly, the natural motion for it to make is from the left toward the front. In acquiring this position the fœtal neck is twisted to a degree, for the body of the fœtus, being still in the uterus and grasped by its contracting walls, does not rotate, the shoulders remaining in the oblique diameter of the superior strait.

As the contractions of the uterus, aided now by those of the abdominal muscles, in great part, increase, the occiput, or short lever of the head, descends—flexion of the chin on the sternum becoming exaggerated—until the neck of the fœtus gets under the

# PLATE XV.



*Presentation of the Vertex. Left Occiput Anterior.*



*Presentation of the Vertex. Right Occiput Anterior* pubic arch. Further descent of the occiput is now impeded, and, since the expelling force is still in action, the effect is applied to the anterior lever, and the chin leaves the sternum or the head extends. The floor of the pelvis bulges greatly, its muscles relaxing laterally and retracting backward, and gradually the forehead, the face, and the chin sweep over the perineum into the world.

We have seen that in the movement of rotation the neck of the fœtus necessarily becomes twisted. As soon as the head is born the neck untwists and the occiput turns toward the left of the woman,—the position it originally occupied. This movement is termed "external rotation, or restitution." The shoulders, still in the oblique diameters, now descend until they reach the pelvic floor, when they rotate antero-posteriorly. The right, or anterior, shoulder, in the position we are considering, descends under the pubic arch and there becomes the fixed point. The left, or posterior, shoulder sweeps down the pelvic floor, and, as a rule, emerges over the margin of the floor first, when it drops down and allows the pubic shoulder to emerge. The emergence of the remainder of the fœtal body is now usually rapid, the nates being expelled after the same manner as the shoulders; that is to say, in the position we are considering, the anterior, or right, natis appearing under the symphysis and there becoming fixed, whilst the posterior, or left, natis sweeps over the pelvic floor and out at the outlet. (Plate XV.)

*R. O. A. Position (Occiput to the Right and Anterior).*—On palpation at the superior strait the hands meet with a sense of greater resistance in front and toward the left, corresponding to the fœtal forehead. Along the right antero-lateral segment of the uterus greater resistance is determined by the palpating hands than along the left segment, corresponding to the back of the fœtus. At the right upper segment of the uterus the outline of the fœtal breech may be determined, and opposite this the small parts may usually be made out.

On auscultation the maximum intensity of the fœtal heart-sounds is determined in the line extending from the umbilicus to the right anterior superior spine, because the dorsum of the fœtus is applied to the right antero-lateral wall of the uterus. On vaginal touch, during labor, the posterior fontanelle is found forward and to the right and the anterior fontanelle behind and to the left. The sagittal suture may be traced along the right oblique diameter of the pelvis, extending from the anterior fontanelle, which is on a level with the left sacro-iliac synchondrosis, to the posterior fontanelle, which is on a level with the right ilio-pectineal eminence.

Flexion and descent are similar in mechanism to that just noted for the position L. O. A. Rotation differs only in that in order to bring the occiput under the pubes the head must turn forward along the right lateral plane of the pelvis. Extension occurs as in case of the position L. O. A. External rotation, or restitution, brings the occiput pointing toward the right thigh of the woman. The left, or anterior, shoulder becomes fixed under the pubic arch, whilst the right, or posterior, shoulder sweeps over the pelvic floor. The left, or anterior, natis passes under the pubic arch and the right, or posterior, natis sweeps over the pelvic floor.

*L. O. P. Position (Occiput to the Left and Posterior).*—On palpation the hands at the pelvic brim must sink in deeply before meeting with resistance, and this is determined to the left and behind.

Along the left lateral segment of the uterus greater resistance is determined than along the right, but the hands must palpate more deeply than in case of the position L. O. A., since the back of the fœtus is deeper and posterior instead of being applied close to the antero-lateral wall of the uterus on the left. In the right upper segment of the uterus the fœtal small parts are, as a rule, easily determined, more to the front, however, than in case of L. O. A. position. On auscultation the maximum intensity of the fœtal heart-sounds is in a line extending from the umbilicus to the left anterior superior spine, but posterior to this line instead of about its centre, as in case of the left anterior position. By vaginal touch, during labor, the posterior fontanelle is determined behind and to the left, and the anterior fontanelle is found on a level with the right ilio-pectineal eminence. The sagittal suture lies in the right oblique diameter of the pelvis, the occiput pointing toward the left sacro-iliac synchondrosis.

The mechanism of this position throughout depends on whether flexion of the chin on the sternum is complete or not. This is an extremely important point to remember, for, as will be noted later, during the progress of labor in this position everything depends on the attendant realizing the importance of maintaining this flexion by means of such measures as will be described. Where flexion is complete the head enters the pelvic superior strait and descends to the pelvic floor without special difficulty; but in case of incomplete flexion the longest diameter of the fœtal head—the occipito-frontal—cannot engage with ease at the superior pelvic strait, and there results alteration in the clinical course of labor, which will be duly dwelt upon.

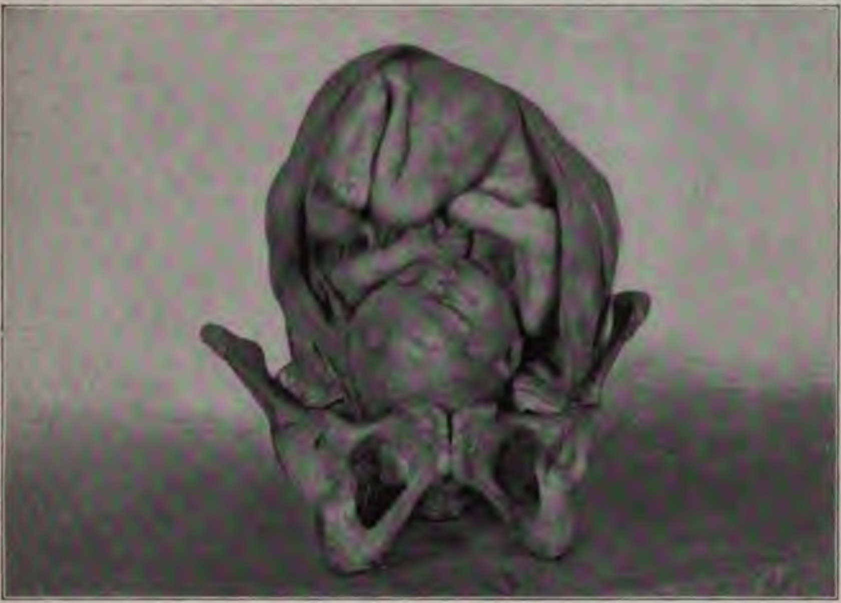
The head, being well flexed, descends to the pelvic floor in the right oblique diameter of the pelvis. On reaching the pelvic floor, under normal conditions of pelvis and of fœtal head, anterior rotation occurs. Since the occiput still points toward the left sacro-iliac synchondrosis, it is apparent that, in order to bring the occiput under the arch of the pubes, it must traverse the posterior lateral pelvic plane and then the anterior left lateral plane. In order to accomplish this, since the posterior lateral plane is deeper than the anterior, the occiput is able, as a rule, to sink deeper before beginning the rotation, flexion becoming exaggerated. The route the occiput has to travel is much longer than in case of the left anterior position, and often rotation does not occur until the pelvic outlet is reached. This is a point to be remembered, because, under normal relations as regards size, this position is apt to give rise to anxiety unless it be borne in mind that rotation is apt to occur even though delayed. The occiput once under the pubic arch, expulsion is similar to the mechanism in case of L. O. A. External restitution throws the occiput farther backward as regards the woman's thigh than in case of L. O. A., but the shoulders and the nates emerge after the same mechanism.

When the fœtal head reaches the pelvic floor in this position and flexion is incomplete, then, instead of rotation occurring anteriorly, the occiput glides into the hollow of the sacrum, giving us a position which may constitute one of the most difficult of all to deal with. This will be fully discussed in speaking of the clinical course of abnormal labor. (Plate XVI.)

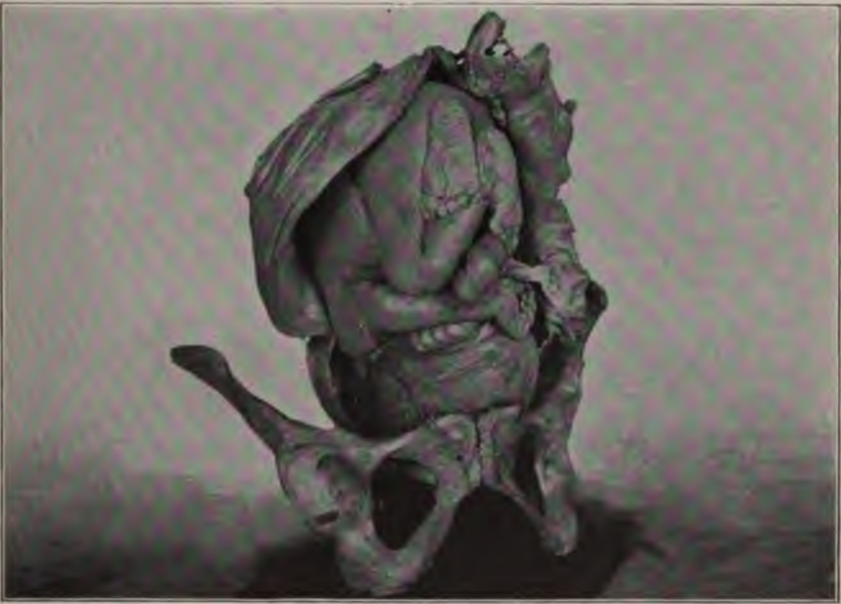
*R. O. P. Position (Occiput to the Right and Posterior).*—On palpation, the back of the fœtus being posterior, the hands must penetrate deeply, in order to determine the greatest resistance, which is along the right lateral segment of the uterus and posterior. The breech is found in the upper right segment of the uterus, but again at a deeper level than in case of R. O. A. The small parts of the fœtus are determined in the left upper segment of the uterus, nearer the midline than in case of R. O. A. On auscultation the maximum intensity of the heart-sounds is posterior to the line extending from the umbilicus to the right anterior superior spine. On vaginal touch, during labor, the posterior fontanelle is determined behind, to the right, near the right sacro-iliac synchondrosis, and the anterior fontanelle is found to the left and in front, on a level with the left ilio-pectineal eminence. The sagittal suture lies in the left oblique diameter of the pelvis.

The mechanism of this position, as in case of L. O. P., depends, for its normal course, as to whether flexion is complete or not, and similar remarks are applicable. Flexion being complete, when the head reaches the pelvic floor the occiput, in order to get under the pubic arch, must traverse the right postero-lateral plane, and next the right antero-lateral plane. After expulsion the occiput points a trifle posterior to the position it assumes in case of the position R. O. A.; the shoulders and the nates are delivered after a similar mechanism, the left engaging under the symphysis and the right sweeping over the pelvic floor. Where flexion is defective, either the head does not rotate until the outlet is practically attained or else the occiput turns into the sacral hollow, giving rise, as will be noted, to an exceedingly unfavorable position as regards the termination of the labor and the integrity of the structures of the pelvic floor.

## PLATE XVI.



*Presentation of the Vertex. Left Occiput Posterior.*



*Presentation of the Vertex. Right Occiput Posterior.*

## IRREGULARITIES IN THE MECHANISM OF PRESENTATIONS OF THE VERTEX.

Under normal conditions the mechanism of labor occurs after the manner described. There are deviations from this mechanism, however, which we must consider.

At the superior strait obliquity of the uterus or disproportion between the pelvic inlet and the presenting part leads to irregularities in the presentation whereby the necessary mechanism of flexion and of descent does not occur, or occurs, at best, after an imperfect fashion. Where there exists imperfect flexion of the head, instead of the occipito-bregmatic circumference presenting, the occipito-frontal presents. Such a position is not at all uncommon before the onset of labor; but, when once this has set in, perfect engagement necessitates perfect flexion. Again, not uncommonly we note what are termed inclined presentations of the vertex, where a parietal protuberance or an ear offers at the centre of the superior strait instead of the vertex. The most common cause of this obliquity of the uterus, and the result of this presentation, is that the long occipito-mental diameter offers at the superior strait. As a rule, the position alters on rectification of the uterine obliquity, the head becomes properly flexed, and labor progresses normally. Should this not occur, obviously, the head becomes impacted at the brim and the woman cannot deliver herself.

In the cavity, as we have noted, deficiency in flexion is a common cause of posterior rotation of the occiput. The indication, therefore, is to promote flexion as soon as its absence is determined. In general, the effect of deficiency in flexion is to retard the progress of labor.

Rotation may fail altogether, particularly in multiparæ with large pelvis or disproportionately small fœtus. The occiput then escapes obliquely along the ischio-pubic rami instead of from under the pubic arch. Again, whilst the head may rotate properly, the shoulders or the trunk may not, in which case they emerge obliquely.

Rotation may become exaggerated; that is to say, the occiput may pass under the symphysis, when, instead of becoming fixed to permit of extension, it turns to the other side of the anterior lateral pelvic plane, a right position becoming a left, or *vice versâ*. Ordinarily this excessive rotation is not permanent, but the occiput shortly reverses its path and again becomes fixed under the pubic arch.

Rotation of the occiput toward the sacrum instead of under the pubic arch is the deviation from the normal mechanism which is most to be feared. In such an event, if the deviation remain permanent, it is exceptional if interference be not called for in order to effect delivery,—especially in the primipara with rigid pelvic floor. In case the head be small in proportion to the pelvic outlet, or in multiparæ with relaxed pelvic floor, the occipito-sacral position may be born spontaneously, but the process is a tedious one and always at the expense of the integrity of the muscles and fascia of the pelvic floor. The occiput must pass along the entire posterior pelvic wall, which is much longer than the anterior. The chin becomes forcibly flexed on the sternum, the forehead becomes the fixed point under the symphysis, and the occiput emerges first, followed by the face and next by the chin. Usually this mechanism occurs obliquely, but often in the midline, when the chances of laceration are greatly increased. Very rarely, as will be noted, flexion fails altogether and the face presents. In such a case, if the chin rotate backward, delivery by the natural efforts is impossible. If the chin rotate under the symphysis, then delivery occurs, as will be noted under " The Mechanism of Face Presentations."

External rotation, being in a measure dependent on the shoulders, will fail if the shoulders descend obliquely, or superrotation will occur if the shoulders rotate in a direction contrary to that which is customary. As a rule, however, where this superrotation occurs it is only apparent, being dependent on an erroneous diagnosis of the original position.

### CHANGES IN THE FŒTAL HEAD UNDER THE INFLUENCE OF THE MECHANISM OF LABOR.

The fœtal head, in order to undergo the mechanism we have described, alters somewhat in shape, or molds, as it is termed. This molding is most marked where there exists disproportion between the pelvis and the fœtus, but, under normal conditions, what is termed the "*caput succedaneum*" forms, which varies in size according to the length of the labor and as to whether the membranes rupture early or late. The *caput succedaneum* is the result of a sero-sanguinolent infiltration of the soft parts of the fœtal head, and it forms on that portion which is not subjected to pressure; in other words, on that portion of the head which offers in the centre of the pelvic planes. It is of no importance and disappears at the end of a few days after labor. Its chief value is that it enables us to confirm, after the birth of the child, the diagnosis we had reached as to the position, for its situation varies according to the position of the occiput. Thus, in right positions it forms on the left lateral surface of the head, usually at the left parietal bone, whilst in left positions it will be found on the right surface of the head at the right parietal bone.

### THE MECHANISM OF FACE PRESENTATIONS.

Presentations of the face occur about once in two hundred and fifty labors, and are, therefore, relatively uncommon. They result from lack of flexion, giving us the chin as the landmark instead of the occiput. According as the chin points to the left or the right antero-lateral or postero-lateral plane of the pelvis we recognize four cardinal positions (using the Latin word *mento* for chin): M. L. A. (mento-left anterior), M. R. A. (mento-right anterior), M. L. P. (mento-left posterior), and M. R. P. (mento-right posterior).

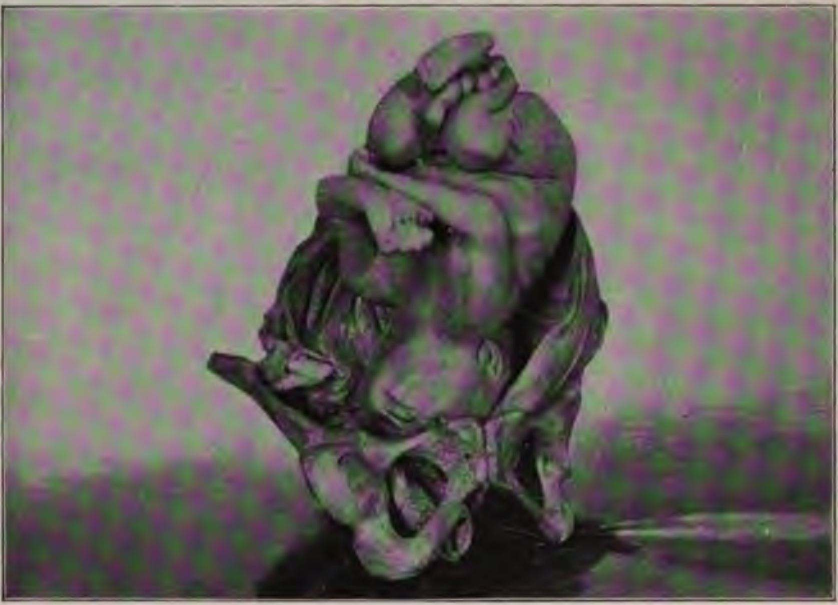
Originally all face presentations are either right or left transverse, but eventually the position assumed is one or the other above noted. Intermediate positions, chin to pubes and chin to sacrum, are described, but, under the influence of the mechanism of labor, these alter to an anterior or a posterior oblique.

The most frequent variety of presentation of the face is M. R. P.; that is to say, the forehead points to the left ilio-pectineal eminence and the chin to the right sacro-iliac synchondrosis. In fact, this position of the face is the direct extension of the most frequent presentation of the vertex,—L. O. A. Before rupture of the membranes the position is really one of the brow, but as soon as rupture occurs, the uterine forces acting through the vertebral column in a direction toward the chin, the head necessarily extends, giving us a presentation of the face. The face occupies the left oblique diameter of the superior strait, the mento-bregmatic diameter of the face lying in this diameter of the pelvis, the bimalar diameter of the face occupying the right oblique diameter of the pelvis. The ventral surface of the fœtus looks backward and to the right, the dorsal surface forward and to the left. The uterine contractions increase the extension until the occiput rests on the dorsum of the fœtus. The head thus extended descends, but never as far as in vertex presentations, since the amount to which it can descend is limited by the length of the neck of the fœtus. When farther descent is impossible the chin rotates along the right antero-lateral plane of the pelvis, the effect being that the chin is brought under the symphysis. This process is a slow one, and when the chin reaches under the arch it becomes the fixed point. The expellent forces are now applied to the forehead, and this gradually sinks lower, flexing and emerging first over the posterior commissure of the vulva. Thus, in succession, the mento-frontal, the mento-bregmatic, the mento-occipital, and finally the mento-suboccipital diameters emerge. When the face has been delivered the shoulders undergo the movement of rotation, the chin turns toward the woman's right thigh, and the remaining evolutions are exactly as in case of presentations of the vertex.

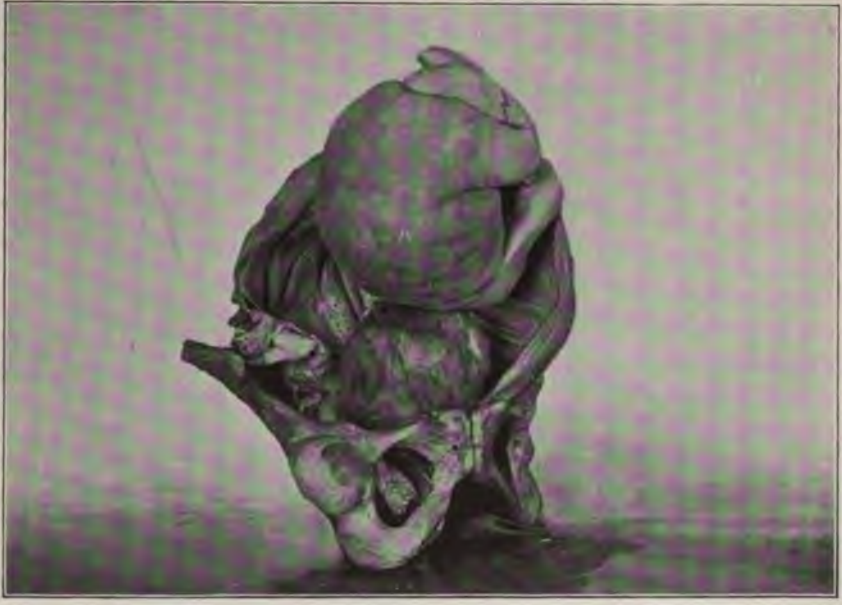
This general description of the mechanism applies to all positions, the variations simply depending on rotation from left to right or from right to left, according as one or the other is requisite to bring the chin under the pubes.

As we noted that rotation of the occiput, in case of vertex pres-

# PLATE XVII.



*Presentation of the Face. Right Mento-anterior.*



*Presentation of the Face. Left Mento-posterior.*

entations into the hollow of the sacrum, or, at any rate, posteriorly instead of anteriorly, constituted an abnormal mechanism, and one which rendered labor difficult or impossible without assistance, similarly, in case of the face, posterior rotation is unfavorable, and to a greater degree, since we may at once state that, when the face has descended with the chin to the sacrum, delivery constitutes a mechanical impossibility without resort to art.

The diagnosis of face presentations prior to labor must be considered impracticable so far as the differentiation of the varieties are concerned. (Plate XVII.) By palpation we may ordinarily, in case the abdominal walls are thin, make out the occiput as more prominent to the right or the left on the side corresponding to the dorsum of the fœtus, and occasionally, even, we may be able to feel the furrow formed between the back and the head by the process of extension of the head; but, beyond this, little information will be secured. On auscultation our suspicions are further aroused, since the maximum intensity of the heart-sounds, owing to the higher position of the head in face cases, will be about on the level of a line running through the umbilicus instead of in the line extending from the umbilicus to one or the other anterior superior spine, as is the case in flexed presentations of the vertex. As a rule, it is by vaginal touch that we may reach a diagnosis, and this is only possible after rupture of the membranes and with sufficient dilatation of the cervix to enable the finger to come in contact with the presenting part. On one side or the other, according to the position, we reach the sagittal suture ending at the anterior fontanelle. When the finger follows this suture as far as possible it reaches the superciliary ridges and the root of the nose. Below this we find the nostrils and the mouth. We may not be able to reach the chin, but a little care in recognizing the landmarks we have just noted will save from error in diagnosis. The direction of the nostrils will teach where the chin lies, and sometimes we may be able to reach one or the other ear, when, bearing in mind the shape of this organ, the diagnosis is again further certified to.

The above landmarks are easy of recognition early in labor, but, in cases where the labor has been prolonged before a proper examination has been made, the formation of the caput on the face practically obliterates them, rendering the diagnosis exceedingly difficult unless we are able to reach the chin. In case of prolonged labor (and face cases are usually very tedious) the caput distorts the face to a great degree. The cheeks and the lips are greatly swelled and the lids of the eyes are enormously œdematous; often the head of the fœtus remains extended for days after delivery.

## PRESENTATIONS OF THE PELVIC EXTREMITY.

The pelvic extremity of the fœtus may offer at the superior pelvic strait either after a complete or an incomplete fashion. A complete presentation is where the breech of the fœtus and the lower extremities offer; that is to say, where the thighs are flexed on the pelvis, the legs on the thighs, and the heels are applied to the nates. (Plate XVIII.)

There are varieties of incomplete presentation; thus, the legs may be extended on the ventral surface of the fœtus, or the feet may offer, or the knees, or either one foot or one knee.

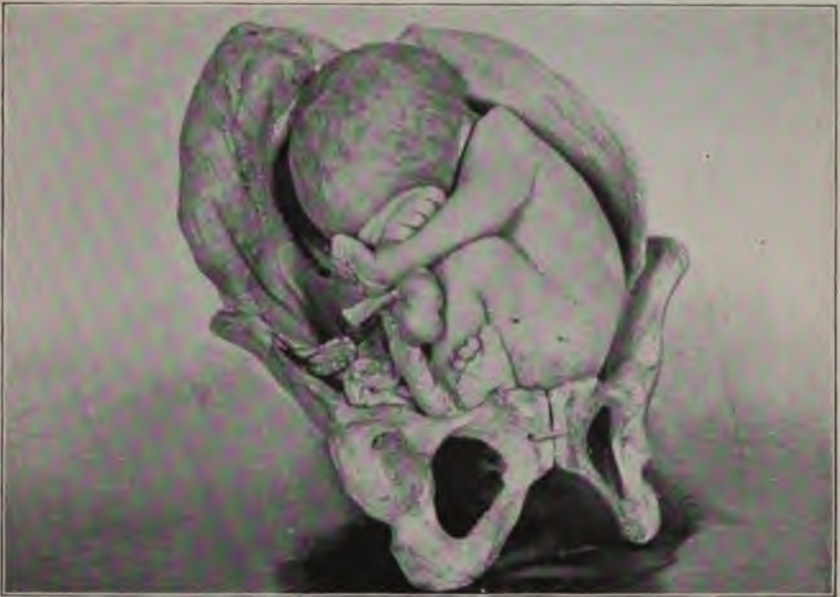
Whatever the variety of presentation, the mechanism of labor is the same.

Presentations of the pelvic extremity are next in frequency to those of the vertex, occurring about once in fifty cases. The positions are denominated according to whether the sacrum of the fœtus points toward the left or the right anterior or posterior lateral plane of the pelvis.

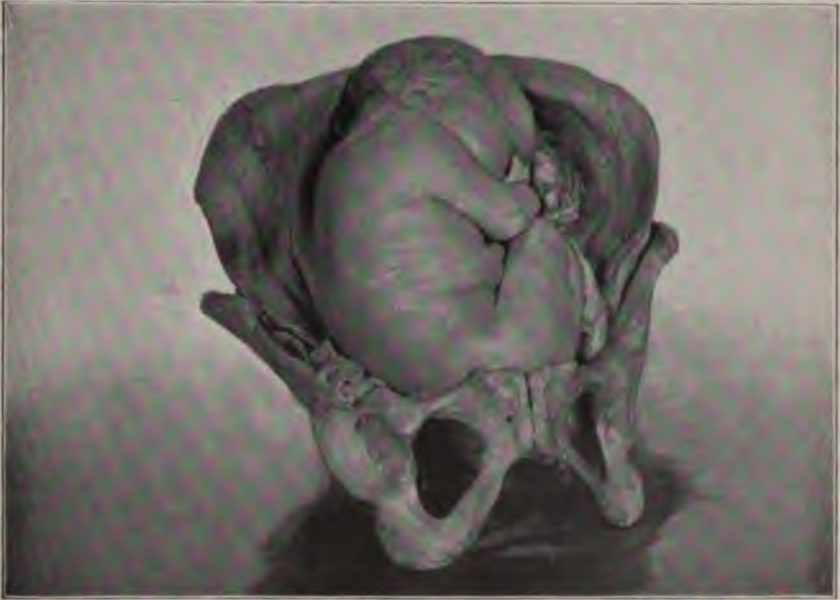
Thus we determine: S. L. A. (sacro-left anterior), S. R. A. (sacro-right anterior), S. L. P. (sacro-left posterior), and S. R. P. (sacro-right posterior).

The left positions are more frequent than the right, even as held in cases of presentations of the vertex.

From a study *in extenso* of the left anterior sacral position the mechanism of the other positions can be readily understood.



*Presentation of the Breech. Left Sacro-anterior Position.*



*Presentation of the Breech. Right Sacro-posterior Position.*

## IRREGULARITIES IN THE MECHANISM OF PRESENTATIONS OF THE VERTEX.

Under normal conditions the mechanism of labor occurs after the manner described. There are deviations from this mechanism, however, which we must consider.

At the superior strait obliquity of the uterus or disproportion between the pelvic inlet and the presenting part leads to irregularities in the presentation whereby the necessary mechanism of flexion and of descent does not occur, or occurs, at best, after an imperfect fashion. Where there exists imperfect flexion of the head, instead of the occipito-bregmatic circumference presenting, the occipito-frontal presents. Such a position is not at all uncommon before the onset of labor; but, when once this has set in, perfect engagement necessitates perfect flexion. Again, not uncommonly we note what are termed inclined presentations of the vertex, where a parietal protuberance or an ear offers at the centre of the superior strait instead of the vertex. The most common cause of this obliquity of the uterus, and the result of this presentation, is that the long occipito-mental diameter offers at the superior strait. As a rule, the position alters on rectification of the uterine obliquity, the head becomes properly flexed, and labor progresses normally. Should this not occur, obviously, the head becomes impacted at the brim and the woman cannot deliver herself.

In the cavity, as we have noted, deficiency in flexion is a common cause of posterior rotation of the occiput. The indication, therefore, is to promote flexion as soon as its absence is determined. In general, the effect of deficiency in flexion is to retard the progress of labor.

Rotation may fail altogether, particularly in multiparæ with large pelvis or disproportionately small fœtus. The occiput then escapes obliquely along the ischio-pubic rami instead of from under the pubic arch. Again, whilst the head may rotate properly, the shoulders or the trunk may not, in which case they emerge obliquely.

when a body is subject to the action of two opposing forces it moves in the direction intermediate between the two, viz., in the direction of least resistance,—the sacrum rotates until the anterior, or left, hip passes under the pubic arch and the posterior, or right, hip glides backward into the sacral concavity. This rotation is necessarily a slow procedure, especially in case of primiparæ, because the soft, yielding breech of the fœtus offers but slight resistance, comparatively, to the opposing forces. The anterior hip having passed under the pubic arch, this hip becomes the fixed point, and around this the posterior hip gradually revolves along the pelvic floor till it emerges at the posterior vulvar commissure. It then drops down toward the woman's anus and the anterior hip emerges from under the symphysis. Whilst the hips have rotated antero-posteriorly, the shoulders and the head have remained transverse. The shoulders now rotate obliquely and thus descend to the pelvic floor, where they meet with resistance and rotate in turn antero-posteriorly, the left shoulder becoming fixed under the pubic arch and the right gliding into the concavity of the sacrum. The left shoulder becoming the fixed point, the right traverses the pelvic floor and is delivered over the posterior vulvar commissure. The left then passes from under the symphysis. The head of the fœtus next rotates into the oblique diameter and descends to the pelvic floor, when it in turn rotates antero-posteriorly, the occiput becoming fixed under the pubic arch, and delivery occurs even as in original presentations of the vertex,—left anterior variety.

### MECHANISM OF SACRO-RIGHT ANTERIOR POSITION.

On palpation the pelvic extremity is found chiefly in the right iliac fossa. The back of the fœtus lies forward and in the right anterior lateral segment of the uterus. The head occupies the left upper uterine segment, and where the liquor amnii is not deficient it may be ballotted there. The maximum intensity of the fœtal heart-sounds is above the umbilicus and to the right. On vaginal touch, after rupture of the membranes, the intergluteal fossa may be traced in the right oblique diameter of the pelvis, the coccyx pointing to the left and backward. The bi-iliac diameter of the fœtus occupies the left oblique diameter of the pelvis.

The mechanism of labor is the same as in case of position S. L. A., except that rotation occurs in the direction from left to right for the hips and from right to left for the occiput.

### MECHANISM OF SACRO-RIGHT POSTERIOR POSITION.

On palpation it is necessary to press in deeply in order to meet with the sense of greater resistance, for the reason that the dorsal plane of the fœtus lies posterior. By turning the woman on her left side the right lateral posterior plane of the uterus is brought more to the front and the back of the fœtus may be indistinctly mapped out, the head occupying the left upper uterine segment, although determinable with greater difficulty, since the occiput is more to the rear. On auscultation the maximum intensity of the heart-sounds is to the right of the umbilicus and above, although more posterior than in case of S. R. A. On vaginal examination, after rupture of the membranes, the intergluteal fossa is found in the left oblique diameter of the pelvis, the coccyx pointing forward and to the left and the sacrum being posterior and to the right. The bis-iliac diameter of the fœtus lies in the right oblique diameter of the pelvis. The mechanism of labor is identical with that described for anterior positions, except that the anterior hip has to traverse a portion of the posterior right lateral plane and the anterior right lateral plane in order to engage under the pubic arch. This rotation occurs from right to left. Rotation is, of course, more prolonged than in case of anterior positions.

### MECHANISM OF SACRO-LEFT POSTERIOR POSITION.

The dorsal plane of the fœtus is directed to the left posterior wall of the uterus; the intergluteal fossa is in the right oblique diameter of the pelvis, and the bis-iliac in the left oblique. The coccyx points forward and to the right, the left hip being forward and to the left. Again, the steps in mechanism are the same as for anterior positions except that rotation is more prolonged since the anterior left hip has to travel a greater distance in order to impinge under the symphysis.

## IRREGULARITIES IN THE MECHANISM OF PRESENTATIONS OF THE PELVIC EXTREMITY.

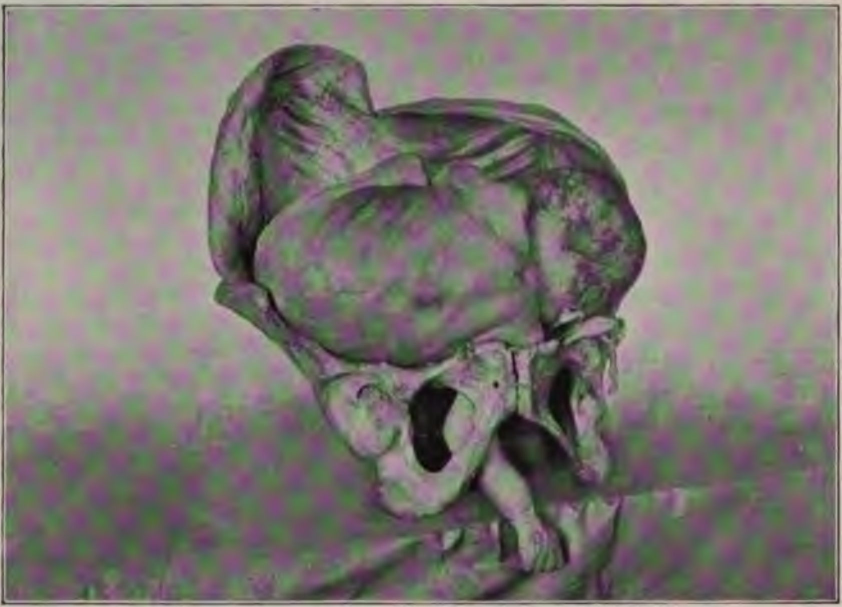
Even as in the case of presentations of the vertex and of the face, the pelvic extremity may present obliquely at the superior strait, and this gives rise to abnormality in the mechanism of engagement. The phenomena of flexion and of descent will occur more readily, furthermore, the more complete the presentation, since the fœtus will thus best adapt itself to the plane of the pelvic inlet. Where the fœtus lies obliquely the uterine contractions never act as favorably as when the fœtus approaches the plane of the superior strait perpendicularly. Again, the less complete the presentation, the less readily does the pelvic extremity act properly in causing dilatation.

Rotation may be incomplete or may fail altogether. The fact, however, that the pelvic extremity is very compressible renders oblique delivery possible, and such an occurrence is by no means rare.

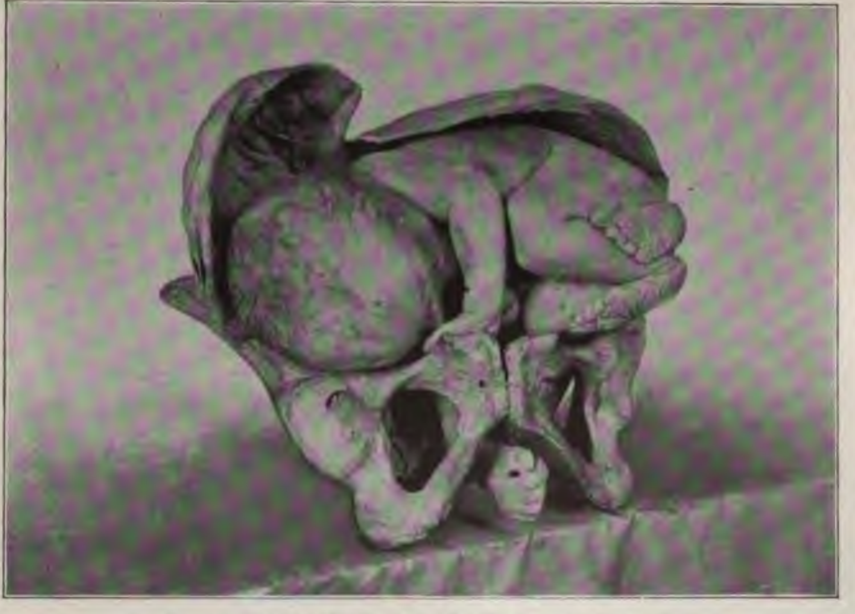
A frequent irregularity in delivery which greatly complicates is extension of the arms above the head. This complication may be traced to irregularity in the contractions of the uterus, whereby the arms are not kept closely applied to the body of the fœtus; but often the arms extend because, after delivery of the trunk, the attendant makes injudicious traction on the breech, especially in the absence of uterine contractions.

After delivery of the trunk the life of the fœtus is necessarily greatly imperiled, since the umbilical cord is likely to become compressed. It is requisite, therefore, that the fœtal head should rotate after a normal manner. The irregularities in mechanism here are dependent on the manner after which rotation of the head occurs.

PLATE XIX.



*Presentation of the Trunk. Dorso-anterior Position.*



*Presentation of the Trunk. Dorso-posterior Position.*

There are two important deviations from the regular mechanism: either the head does not rotate at all or else it rotates posteriorly. Again, the head may rotate, but, instead of remaining flexed, it extends. In the latter event the chin is arrested behind, above, or below the sacro-vertebral angle. Each one of these irregularities in mechanism requires interference on the part of the attendant, as will be noted when the subject of "The Management of Abnormal Labor" is considered.

During the descent of the pelvic extremity that portion which is subjected to the least pressure swells according to the duration of the labor after rupture of the membranes. As a rule, the caput forms on the anterior buttock, but not exceptionally the swelling extends to the genitals, the scrotum being greatly enlarged.

## Presentations of the Trunk.

Presentations of the trunk are denominated according as the right or the left shoulder presents, with the fœtus offering its dorsal or its ventral surface anterior or posterior. The head of the fœtus is, therefore, either to the left or to the right. The simplest classification, therefore, is that which takes account both of which shoulder presents and in what direction the head of the fœtus lies. Thus, we recognize the following positions :—

Head to the right with the right shoulder presenting, in which case the ventral surface of the fœtus is in front.

Head to the left with the left shoulder presenting, in which case the ventral surface of the fœtus is in front.

Head to the right with the left shoulder presenting, in which case the dorsal surface of the fœtus is in front.

Head to the left with the right shoulder presenting, in which case the dorsal surface of the fœtus is in front.

The diagnosis of position, in case of presentation of the trunk, depends, therefore, obviously, on the determination of which shoulder offers and on whether the head lies to the right or to the left. (Plate XIX.) Only very exceptionally are these positions exact ones. As a rule, either the elbow offers instead of the shoulder or else the hand or the hand and the arm prolapse, in which event the diagnosis is greatly simplified, since the recognition of that hand which is prolapsed at once tells us the necessary position. These points will be appropriately dwelt upon in the chapter which treats of "The Management of Labor." At the present we will simply study the mechanism of delivery in this untoward presentation.

At the outset the statement holds that almost invariably presentation of the trunk calls for intervention, and, therefore, the mechanism is that which is imparted by the attendant. The classical steps which apply to other presentations are followed here, however, according to the method selected for intervention.

Nature's mechanism of dealing with presentations of the trunk is twofold: Either *spontaneous version* occurs or else *spontaneous evolution.*

By spontaneous version we mean that, under the influence of the expulsory forces, the trunk is converted into either a presentation of the cephalic or of the pelvic pole of the fœtus. Before the onset of labor spontaneous version occurs with great frequency. Indeed, before engagement of the fœtal presenting part, unless the liquor amnii is markedly deficient, there is nothing to prevent the fœtus from executing any motion. After engagement, however, or after the rupture of the membranes, spontaneous version is of very rare occurrence, although it may and does occur.

The mechanism of spontaneous version is the following: Where spontaneous version occurs, if the case has been carefully examined beforehand, it will be noted that one or another pole of the fœtus lies lower, although it is still the shoulder which offers. The force of the uterine contractions is thus not directed against or in favor of the engagement of the presenting part, but it acts unevenly, and the fœtal pole which lies lowest is forced down. The shoulder thus necessarily recedes and the head or the breech takes its place. Obviously, such mechanism is hardly likely to occur after engagement, and the attendant should, in any event, never expect it; but there are many cases recorded where, even after engagement and descent, version has occurred, although always in cases where the fœtus has been very small or the pelvis very large.

Spontaneous version having occurred, delivery takes place in accordance with the mechanism peculiar to either vertex or pelvic presentation, according as the conversion has been into one or the other type.

By spontaneous evolution is understood the delivery of the trunk, although the shoulder remains the presenting part. These instances are exceedingly rare, but they are authentic. The mechanism is as follows:—

The membranes having ruptured and the presenting shoulder having engaged, the uterus applies itself closely to the fœtus, compressing the component parts together. The result is that the cephalic pole tends to approach as closely as it can the pelvic pole. The shoulder, impelled by the expellent forces, descends as far as it can, and the extent of descent that is possible depends on the length of the fœtal neck. After a variable interval, usually a protracted one, rotation occurs. The shoulder is thus brought under the symphysis. Coincident with rotation of the shoulder the head moves above the symphysis, and it there becomes fixed. The anterior shoulder and the head of the fœtus are situated in front, and the posterior shoulder, with the rest of the fœtus, lies behind. As the uterine contractions continue to act, the posterior shoulder is forced downward along the posterior portion of the pelvis and emerges over the posterior vulvar commissure, followed in turn by the thorax, the hips, and the pelvic extremity. The anterior shoulder, during these evolutions, has remained fixed under the symphysis and is now expelled, the head remaining behind to be born according to the mechanism of delivery of the after-coming head.

*Caput Succedaneum.*—The *caput succedaneum* forms on that portion of the fœtus which is subjected to the least pressure, and therefore is found on the anterior shoulder, as a rule. This shoulder and the corresponding arm and hand are greatly enlarged and ecchymosed, as would be expected when we remember that the described mechanism is exceedingly tedious.

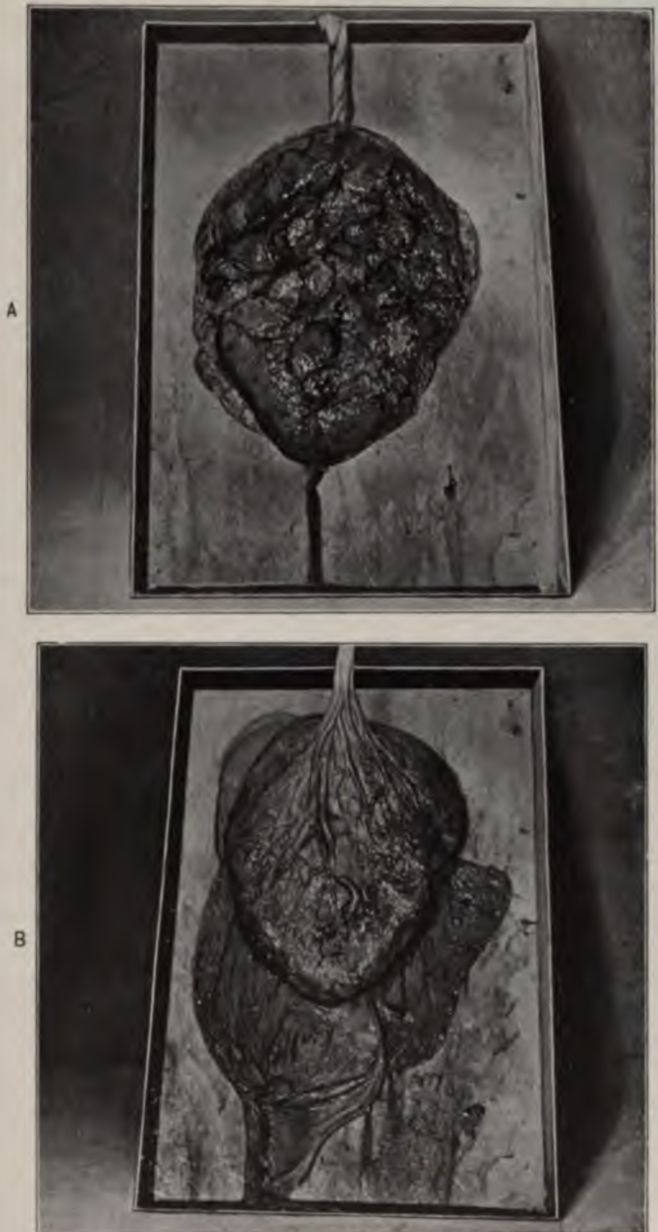
## THE MECHANISM OF PLACENTAL DELIVERY.

Since labor does not terminate with the expulsion of the fœtus, but remains incomplete until the placenta has been delivered, it remains for us to consider the mechanism of placental expulsion, a proper understanding of which is requisite in order to enable the attendant to determine, in actual practice, the boundary-line between the normal and the abnormal in this stage of labor.

The fœtus having been expelled from the uterus, there remains behind the placenta with the membranes. The placenta, at term, consists of a spongy tissue, rich in blood-vessels, measuring, on an average, about seven and one-half inches in diameter, irregularly round in shape. One surface is covered by the amnion and is smooth; the other surface is applied to the uterus and is rough. (Plate XX.) This uterine surface is grooved and is divided into spaces, each of which forms a placental tuft, or cotyledon. At its edges the placenta thins out and merges into the membranes. The rough uterine surface of the placenta is covered by that part of the decidual membrane which separates from the uterus when the placenta is expelled. It will be remembered that the uterus, at the site of implantation of the placenta, is thickened through the formation of the serotina, and the mechanism of placental expulsion is completed through the separation of a portion of this,—a splitting, as it were; so that, after placental delivery, part of the serotina remains on the uterus and the balance covers the maternal part of the placenta.

The placenta in position follows the curvature of the uterine walls, the amniotic or fœtal surface being concave and the maternal surface being convex. After the uterus has expelled the fœtus there occurs a pause, a period of rest, as will be dwelt upon later on. During this pause what is termed the retroplacental hæmatoma is formed, varying in size and consisting simply of an effusion of blood under the placenta. When, after a variable interval, the uterus again contracts, the major part of its contents having been expelled, the uterine walls can retract to a greater degree, and the result is not

## PLATE XX.



*The Placenta.*

*A. The Maternal Surface.*
*B. The Fœtal Surface and the Membranes*

alone that the placenta is pressed upon firmly, but also that the walls of the uterus retract greatly at the site of placental attachment. The result of these three causes—formation of retroplacental clot, compression of the placenta, and retraction of the uterine walls—is that the decidual surface is split and the placenta becomes separated from the uterus. This may be taken as the usual method of placental separation. Occasionally no retroplacental clot forms, or, at any rate, it is so slight as not to be effective in the mechanism; or else a large retroplacental clot forms at the centre of placental attachment, the result being that this central portion bulges downward, the periphery remaining attached. Then the separation of the placenta occurs more gradually, one area after another becoming detached.

Separation of the placenta having taken place, the next step is expulsion. Either immediately after separation or after an interval the uterine contractions drive the placenta from the uterus into the vagina or out of the vulva. There are two ways after which the placenta is expelled from the uterus: it passes out edgewise or else its surface is inverted, the fœtal portion appearing first. The consensus of opinion favors the view that the edgewise expulsion is the most frequent, the placenta sliding down along the uterine wall and presenting its edge at the cervix and thus entering the vagina. It is highly probable that expulsion of the placenta through inversion—that is to say, the fœtal surface appearing first—is due, as a rule, to injudicious interference with the normal mechanism, such as by traction on the cord to expedite delivery.

# CHAPTER VI.

## THE CLINICAL COURSE OF LABOR.

The clinical phenomena of labor are conveniently studied under the following headings: "The Precursory Phenomena, or the Stage of Onset"; "The Phenomena of Dilatation, or the so-called First Stage"; "The Phenomena of Expulsion, or the so-called Second Stage"; "The Phenomena of Retraction, or the so-called Third Stage."

### PRECURSORY STAGE OF LABOR.

The active phenomena of labor rarely set in suddenly. As a rule, there are certain precursory signs which point to impending labor. The first is the subsidence of the uterus,—the so-called *lightening*. This is due to the sinking of the uterus toward the pelvic brim, which is associated with a greater or less degree of engagement of the fœtal presenting part. The abdomen becomes less prominent at the ensiform cartilage, the woman suffering less in consequence from interference with respiration, and the abdomen bulging more between the umbilicus and the pubes. A result of this sinking of the uterus is that the pressure symptoms on the bladder and on the rectum are intensified, micturition being more frequent and occasionally an artificial diarrhœa being provoked. Œdema of the lower extremities and of the genitals is increased, and often there is an hypersecretion from the vagina, the result of increased venous congestion.

These precursory signs set in usually about two weeks before the appearance of active labor, and they furnish a fairly reliable guide for the prediction of the time of labor. For a few days preceding the appearance of active contractions the woman complains of abdominal pain, which is associated with a hardening of the uterine tumor. We have noted that, throughout pregnancy, the uterus normally contracts and relaxes, giving us the intermittent uterine contractions which, we have seen, are valuable as assisting us in reaching a diagnosis of pregnancy. These precursory pains are simply the intensification of the normal uterine contractions, but, since they have very little actual effect in causing dilatation, they are known as " false " pains.

On vaginal examination at this period we note marked changes in the cervix. It gradually ceases to exist as such, becoming merged in the lower uterine segment. This change in the cervix was formerly considered as only an apparent one, due to the so-called normal softening; but to-day we know that the change is the direct consequence of the merging of the cervix into the lower uterine segment. So long as the vaginal portion of the cervix remains it may be definitely concluded that normal labor is not impending. Just so soon as the effacement of the vaginal portion of the cervix occurs, this may be taken as a sign that labor is imminent. These cervical changes differ according as the woman is a primipara or a multipara. In the primipara the fœtal part becomes engaged early and the cervical changes are rapid; so that, just before active labor sets in, the internal os and the external os have practically merged, the cervix being represented simply by a dimple in the vaginal vault.

In case of the multipara, engagement of the fœtal presenting part is less pronounced and effacement of the cervix is less marked. The cervical canal, however, is apt to be open, the finger readily reaching the internal os and the membranes. Even here, however, so long as there remains space between the external and the internal os it may be safely predicted that normal labor is not impending.

These changes which we have noted set in about the thirty-eighth week of pregnancy; that is to say, in the neighborhood of two weeks before term. About the fortieth week true labor sets in and we pass to the consideration of dilatation.

### STAGE OF DILATATION.

This stage is known as the first stage of labor. During this stage the cervix opens widely, so as to allow the presenting part to enter the vagina. We have seen that, for a number of days prior to the onset of labor, the woman suffers from pains to which the term "false" has been applied, for the reason that they are not effective, to an appreciable degree, in causing dilatation of the cervix. These false pains are short and nagging, being located chiefly in the lower part of the abdomen. True labor-pains, on the other hand, differ in site and in character. These pains are simply the intensification of the intermittent contractions of the uterus which prevail throughout pregnancy. They are still intermittent, but they possess a true rhythm. They start from the back and extend around the abdomen. At first of short duration, as uterine action becomes intensified they last for fully one minute. The contractions are purely involuntary. During their continuance the woman suffers greatly, the face becoming flushed and the pulse accelerated. Following the subsidence of the contraction there occurs a pause of variable interval, this being succeeded by renewed contraction. The intermittent nature of these uterine contractions subserves the double purpose of enabling the woman to recover strength to bear another, and also to enable the uterine circulation to become re-established, which, in turn, enables the blood of the fœtus to become oxygenated. Further still, the intermittence of the contractions results in gradual yielding of the muscular fibres of the cervix, whereas continuous contraction would result in spasm and defeat the object aimed at, which is the opening of the cervix.

As the uterus contracts it changes in shape and in its axis. The organ hardens and, in the interval, again becomes soft. Its shape becomes cylindrical, the transverse diameter becoming shortened and the antero-posterior diameter lengthened. The position of the uterus changes, the fundus approaching the anterior abdominal wall, its longitudinal axis, therefore, tending to become more coincident with that of the axis of the superior strait.

The effect of these contractions is twofold: The cervix is caused to open and the membranes are driven down toward and into the opening cervix, which fact also, as we shall note, assists in dilatation.

The manner after which the cervix is caused to open is the following: The body of the uterus is composed mainly of longitudinal muscular fibres, and, beneath these, of a layer of transverse fibres. When these fibres are in action the effect is that the organ becomes shortened antero-posteriorly and transversely. The cervix, on the other hand, is composed of circular fibres, which are attached to the longitudinal fibres of the body of the organ. It is at once apparent that the necessary effect of the contraction of the muscular fibres of the body of the organ is the exercise of traction on the cervical fibres. As the uterine contractions increase in force, the fibres of the body of the organ being stronger than the circular fibres of the cervix, the latter must needs yield or relax, and thus the cervix opens.

A further effect of the uterine contractions is to drive its contents downward toward the cervix. Under normal conditions, since the expelling force acts in the direction of the axis of the inlet of the pelvis, the contents of the uterus exert direct pressure on the cervix. The fœtus floats in its membranes, and when the uterus contracts the water in these membranes is driven down, forming an hydrostatic wedge of great dilating power. It is likely, further, that the pressure of this wedge on the cervix acts as a direct irritant, which, of course, leads to an intensification of the uterine contraction. After the membranes rupture, if this should occur prior to complete dilatation of the cervix, the fœtus itself, descending against the cervix, acts as the wedge. Premature rupture of the membranes, however, is undesirable, as will be noted, because the fœtal presenting part can never as effectually assist in dilatation, since it cannot project into the cervix as can the bag of waters.

This process of dilatation of the cervix is slow and progressive under normal conditions. As a rule, ten to fifteen hours are requisite in the primipara and six to eight in the woman who has borne children. During dilatation the shape of the cervix varies according as the woman is a primipara or not. In the primipara the opening of the cervix retains its circular shape, its edges becoming thinner and the presenting part, owing to its deeper engagement from the start, being more accessible to the examining finger. In the multipara the shape assumed will depend on the lesions which the cervix has suffered at previous deliveries and the amount of the cicatricial tissue which has in consequence formed.

As the cervix dilates certain of its muscular fibres tear superficially, giving rise to a bloody oozing known as the "show," because its appearance is distinct evidence that dilatation is progressing.

Whilst, as a rule, under normal conditions, when once uterine contractions set in they are apt to continue after a rhythmical fashion, not infrequently these contractions will cease for hours or, instead of retaining the normal rhythm, they will become short in duration and nagging, being absolutely lacking in dilating force. If the membranes have not ruptured, the cessation of the contractions need cause no anxiety, because the fœtus cannot possibly suffer so long as it remains uncompressed in its natural uterine habitat, but the occurrence of the nagging contractions of short duration tires out the woman and usually means that the uterine force is not acting in the proper axis or at a disadvantage, owing, possibly, to faulty position or to disproportion between the pelvis and the fœtus.

As the cervix approaches complete dilatation its circular fibres are drawn upward until they tend to retract over the fœtal presenting part. The membranes then rupture with a gush; the uterine walls become closely applied to the fœtus; flexion of the fœtus is intensified, and the presenting part passes through the open cervix into the upper part of the vagina. There is, however, no established rule as regards the time when rupture of the membranes occurs. At times rupture sets in even before labor, although then, often, it will be found that there existed a double amniotic sac, the second remaining intact. Again, the membranes may not rupture until the fœtus is on the point of being born, or even until after birth, the child coming into the world surrounded by its "caul." Frequently, where the membranes are thin or careless vaginal examination is made during a uterine contraction, they rupture before the cervix has dilated to an appreciable degree. This occurrence, as will be noted, is unfavorable, since the process of dilatation is thus impeded and much prolonged.

As the membranes bulge through the cervix they assume various shapes, according to the amount of water they contain and the nature of the presenting part. They are tense and resisting during a contraction and soft and flaccid during the interval. The degree of bulging depends not alone on the amount of liquor amnii present, but also on the presenting fœtal part. Thus, in case of a normal presentation of the vertex, the membranes will never bulge to the same degree as in case of presentation of the pelvic extremity, for the reason that the vertex can apply itself more closely to the lower uterine segment than can the breech, and therefore less water can emerge in front of the vertex. This is a wise provision, as will be noted, since, in case of presentation of the pelvic extremity, dilatation must necessarily be accomplished by the membranes, the breech, from its shape, not forming a dilating wedge, as may the vertex.

Dilatation of the cervix having been completed and the membranes having ruptured, the presenting part engages and escapes from the cervix, and we pass to the

### STAGE OF EXPULSION.

During this stage the contractions of the uterus are re-enforced by the action of the abdominal muscles. The same rhythmical character is present,—first the *contraction*, then the *relaxation*, then the *pause*. During the period of contraction the fœtal presenting part descends in the vagina, and during the pause it recedes a trifle, thus avoiding the consequences of continuous pressure on the soft parts of the pelvis. The duration of this, the second stage of labor, is exceedingly variable. In the multipara with relaxed pelvic floor, as soon as the cervix has dilated, the presenting part may descend, rotate, and be delivered by a very few pains and in only a few minutes. In the primipara, however, the condition of the soft parts is different. Whilst during the latter part of pregnancy the vagina has undergone changes which prepare it for the process of dilatation, to which it must become subjected, the muscles and the fascia of the pelvic floor require time to stretch; so that ordinarily the second stage in the primipara lasts two or three hours. The greatest resistance is offered at the outlet, and it is through the intermittence of the pressure that the vulvar cleft is caused to yield without resulting lesion. During this expulsory stage of labor the actions and the appearance of the woman alter. She assists herself during the contractions; that is to say, through forcible bearing-down effort she is able to drive the presenting part downward. As the presenting part reaches the outlet the urethra is pushed upward, the perineum bulges outward, the anus dilates, and the suffering of the woman becomes of the most acute type. It is here, as will be noted, that anæsthesia should be resorted to, not only to spare the woman suffering, but also to protect the integrity of the maternal soft parts, which are greatly endangered if the bearing-down efforts are not partially suspended. The contractions continuing, the fœtus is shortly expelled and then follows the

### STAGE OF UTERINE RETRACTION, OR OF PLACENTAL EXPULSION.

The birth of the child is followed by a gush of bloody fluid consisting of the residual liquor amnii and of blood. A pause in the phenomena then ensues. This pause is conservative, in that the woman is granted a few minutes' rest from her labors, and the uterus is enabled to regain tone for the final act of delivery. This period of rest varies in duration from a few minutes to fifteen or twenty. During the interval the umbilical cord is tied off and the child is separated from its mother. In rare instances the cessation of contraction is continuous, because in the final act of delivery of the child the placenta has also been expelled from the uterus into the vagina, rarer still into the world. As we have noted, the detachment of the placenta takes place through retraction of the uterus, consequent compression of the placenta, and separation of a layer of the decidua at the site of insertion. This detachment does not take place after a uniform manner. At times the centre becomes detached, a retroplacental hæmatoma of considerable size forming, or else the primary detachment is marginal. Whatever the case, uterine retraction is followed by uterine contraction, and the placenta, as a rule, slides down the uterine wall, the fœtal surface rolled together, and thus it passes into the vagina and through the vulvar cleft. The expulsion of the placenta after this normal fashion is practically painless, and is followed by the passage of clots and a variable quantity of blood. For a time thereafter there is a tendency to uterine relaxation, especially in instances where the act of labor has been protracted and the uterus has in consequence lost tone, but, eventually, firm uterine contraction sets in, which is so desirable as a safeguard against hæmorrhage. After expulsion of the placenta the maternal and the fœtal surface should be carefully examined to determine if all has been shed, since, as will be noted, complete expulsion is essential to a smooth puerperal state.

The completion of the stage of placental expulsion marks the beginning of the puerperium.

## ANOMALIES IN THE CLINICAL PHENOMENA.

The physiological course of normal labor is as we have stated it. Anomalies in the phenomena vary in degree, and when they are intensified the course of the labor becomes abnormal.

The contractions of the uterus may, from one or another cause, be inefficient as regards provoking dilatation of the cervix. The woman may be of the highly nervous, hyperæsthetic type, in whom reflex nerve irritability is, at best, abnormal, and then the contractions lack the requisite rhythm or are short in duration, and in so far ineffective. So long as the membranes remain unruptured the consequent prolongation of the labor has no effect on the fœtus, but the woman becomes exhausted and, if means are not taken to secure regular and effective contractions, the fœtus suffers indirectly, since it necessarily sympathizes with the maternal organism. Another consequence of ineffective, irregular contraction is the provoking of spasm of the uterus; in which event, the uterine circulation being impeded, the fœtus necessarily suffers. After the rupture of the membranes tetanic spasm of the uterus, if not relieved, will kill the fœtus. The contractions of the uterus, on the other hand, may be excessive; that is to say, but little pause occurs between the contractions. The effect of this, aside from tiring out the woman, may be the occurrence of precipitate labor, with the consequent risks to the woman and the child. The fœtus, placenta, and the membranes being suddenly expelled, hæmorrhage from the organ may be profuse enough to exsanguinate the woman before the uterus has a chance to regain tone and contract efficiently. Should the woman be in the erect position when this precipitate delivery occurs the fœtus might strike the floor with sufficient force to kill it, and inversion of the uterus may occur. After the rupture of the membranes the uterine contractions may affect chiefly the lower uterine segment; that is to say, the portion just above the internal os where the body of the uterus is differentiated from the cervix. In such an event this area may be thrown into a spasm and a contraction ring may form, which impedes further descent of the fœtus unless the attendant interferes. Irregular spasm and contraction of this nature may, further, lead to rupture of the uterus.

After the rupture of the membranes the abdominal walls may not respond and do their share toward effecting the expulsion of the fœtus. These walls may be weakened from one or another cause, such as hernia or laxity from excessive distension long continued, and then the *vis a tergo* will not suffice to overcome the resistance of the pelvic floor.

Obliquity of the uterus, whereby the uterine force is unable to act in the centre of the pelvic planes, pendulous abdomen, disproportion between the pelvis and the fœtus, abnormal presentation, intercurrent disease,—Bright's or cardiac lesion,—such are further causes of inefficiency in the uterine contractions, the result of which is delayed labor, possibly calling for active interference.

Even though the uterine contractions follow the normal course, dilatability of the cervix may be excessively slow or impossible unless the attendant interferes. Premature rupture of the membranes, especially in case of an abnormal presentation, and even in case of the normal presentation of the pelvic extremity, uniformly retards labor, for the reason that the dilating hydrostatic wedge is absent. Rigidity of the muscles of the cervix, the result of cicatrices from previous labors, or of actual disease of the cervix, such as beginning cancer, or the result of the application of caustics, —all these factors act as impediments to normal dilatation. Whilst the uterine and abdominal contractions are strong and regular, in certain of these instances the attendant must interfere in order to avoid maternal exhaustion with the concomitant fœtal risk.

After rupture of the membranes and complete dilatation, notwithstanding strong and regular expulsory efforts, descent of the fœtal part may be impeded. Very frequently this will be found to be the case with primiparæ who have passed the age of 25, the cause of arrest being an unyielding coccyx or an actual ankylosis at an acute angle. Instances of this nature will usually call for the interference on the part of the attendant not alone in order to release the impacted presenting part, but also in order to avoid protracted pressure on the maternal soft parts. During the second, or the expulsory, stage of labor we have noted that the normal clinical course is for the presenting part to descend during a contraction and to recede during the interval. This is a wise provision, since the result is that continuous pressure is not exerted on the muscles of the pelvic floor. Just as soon as this recession of the presenting part fails to occur the time has arrived for interference, else sloughing and, perhaps, fistula into the bladder or into the rectum may occur.

When, under the influence of the expulsory contractions, the presenting part reaches the pelvic floor, excessive rigidity may lead to protraction of the stage of final expulsion. The vulvar cleft may be actually too small to allow of the expulsion of the presenting part, even though there be no impediment from the side of the pelvis; or else the muscles and the fascia may be excessively rigid, in which case, in order to avoid deep laceration, it may be necessary for the attendant to interfere by the performance of episiotomy. (*Vide* " Obstetric Surgery.")

During the first and the second stages of labor hæmorrhage may occur from premature separation of the placenta in part or in whole. Such hæmorrhage constitutes one of the most alarming of obstetrical complications. It stands to reason that the life of the fœtus is directly placed in jeopardy and, as we shall see, the woman may become exsanguinated before the attendant can render her any service. Hæmorrhage of this character is called *concealed* hæmorrhage, for the reason that the blood may be effused above the uterine contents, but little appearing externally, often not enough to attract the attention of the attendant. The general clinical phenomena, however, alter. The pulse becomes rapid; the woman complains of feeling faint; the uterine tumor distends abnormally; the contractions alter in character, becoming weak and ineffective or ceasing altogether, as a result of the weakened condition of the woman and, further, as a result of the distension of the uterus. All this time, as we have stated, there may be no appreciable flow of blood externally, and yet the woman is surely drifting into a condition of acute anæmia. The watchful observer will note the alteration in the clinical phenomena. On auscultation he will determine that the fœtal heart is becoming rapid and faint, and the change in the maternal pulse will awaken his suspicions. Perhaps, on pushing up the presenting part, a gush of blood will ensue or clots will pass; but usually the diagnosis of concealed hæmorrhage must be based on the alteration in the clinical phenomena, and the course of action should be simply according to the surgical rule of getting at the source of the hæmorrhage and checking it. The chances are that when the diagnosis is strongly suggestive the child has already succumbed. Whatever is done is in the interests of the woman alone. Since the hæmorrhage is going on in the uterus, dissecting off the placenta and distending the uterus, the sole way to check it is to empty the organ in the quickest possible manner consistent with its integrity, and then resorting to compression of the bleeding-point, so to speak, according to the method which will be described under the subject of "The Treatment of Post-partum Hæmorrhage." It should be remembered that, prior to rupture of the membranes, the amount of blood which may be effused is simply limited by the distensibility of the uterus. As an actual fact, the woman, in certain reported cases, has practically bled to death before the complication has been recognized. The emptying of the uterus has been followed by the placenta and quarts of blood and of clots.

After the completion of the second stage of labor certain anomalies of the third stage may demand interference. As a rule, very little hæmorrhage accompanies the expulsion of the placenta. Exceptionally the uterus has lost tone, in which event it does not contract, and the attendant may have to face one of the most alarming complications of delivery. If the uterus does not contract the uterine sinuses do not close, and in this event the amount of blood which the woman may lose in a relatively short time may be sufficient to exsanguinate her. The methods for meeting this emergency will be treated of in the proper place, the aim being the promotion of uterine retractility and contractility, or else the compression of the bleeding-point, so to speak, in accordance with the surgical rule applicable to hæmorrhage.

The third stage may further be anomalous in that, notwithstanding efficient retractility of the uterus, the placenta does not separate, owing to the fact that pre-existing disease of the endometrium or disease of the decidua has led to the formation of adhesions at the placental site. These instances are exceptional, since disease of either type is apt to cause the woman to shed the fœtus before term. Apparent adherence of the placenta is not uncommon. In such an event either the placenta has been shed and is lodged in the upper vagina or else the internal os or the lower uterine segment has closed down and the placenta has not passed through, although lying free in the cavity of the uterus. The formation of a contraction ring above the level of what would constitute the internal os were the parts not dilated is a common cause of retention of the placenta.

Ordinarily the course of labor is not associated with lesion of the soft parts. Lacerations of the cervix and of the pelvic floor, however, are of not infrequent occurrence, and this, too, without the attendant being necessarily to blame. The course of labor should never be deemed completed until these lesions are looked for by digital touch of the cervix and direct inspection of the pelvic floor, since the attendant will be blamed, and rightly so, who, when repair is feasible, does not resort to it in accordance with the methods exemplified in the portion of this work dealing with the surgery of the puerperal state. (*Vide* "Obstetric Surgery.")

# CHAPTER VII.

## MANAGEMENT OF NORMAL AND ABNORMAL LABOR.

### NORMAL LABOR.

UNDER the term "normal labor" are understood instances where the fœtus enters the pelvic inlet and emerges at the pelvic outlet after a fashion in accordance with the normal mechanism of labor. Engagement, descent, rotation, extension, and delivery occur after that fashion which is essential for the welfare of the woman and of the child, under the natural efforts and within that time-limit which, according to the individual case, is consistent with the conservation of the strength of the woman and the vitality of the fœtus. Under this definition any variety of presentation may be normal, since, as we have noted, presentations of the pelvic extremity and of the face may be terminated within the stated limits and with the stated result.

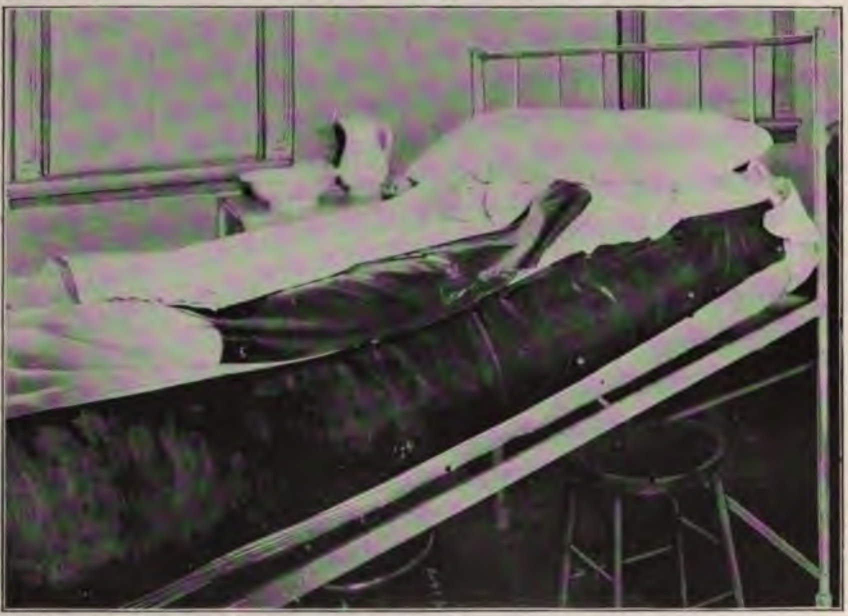
Before entering into the consideration of the management of normal labor it is necessary to consider certain factors, attention to which is essential in order that the labor, and in particular the period following, may proceed after a normal fashion. These factors are the preparation of the surroundings of the woman and the woman herself. Whilst under unfavorable surroundings and in an unfavorable condition the phenomena of labor may progress after a normal manner, it stands to reason that that woman will best stand the ordeal of actual labor and best withstand the possible complications of the puerperal state who has been confined under the best possible conditions of personal health and of personal surroundings. The ideal conditions requisite for smooth delivery and smooth puerperal state are not always attainable, but the nearer these are approximated, the better the ultimate result.

Our prelude to the study of normal labor—and this also applies to the deviations from the normal—must consider the condition of the lying-in room and the necessary precedent care of the woman about to be confined. Labor being essentially a physiological process, complications which ensue should only be those which cannot be forestalled.

### THE LYING-IN ROOM.

Cleanliness, fresh air, and sunlight are characteristics which the lying-in room should possess as far as possible. Whilst it is doubtful if puerperal infection can be traced to impure surroundings,—that is to say, can occur through atmospheric influence,—it nevertheless holds that in the performance of a physiological process such as labor, even as during the passage through a disease, the human body can best withstand agencies which may work harm if the conditions which hold sway over health are present. The best room in the dwelling should be selected for the lying-in room, and where possible this room should have no direct contact with the water-closet. It should contain as few articles of furniture as possible, heavy rugs and hangings being removed. The room should be thoroughly cleansed, the walls wiped down and the bare floor scrubbed. Even though the carpets and hangings may do no harm, they are at least liable to damage, and the air is purer and sweeter for their absence. In case at any previous time an acute infectious disease has run its course in the room, greater precautions are necessary. It is accepted to-day that the lying-in woman is exceedingly susceptible to the absorption of contagion, and, therefore, a room which has been occupied by a person sick of scarlet fever, measles, or the like, should be prepared even as would the ward of a well-appointed hospital. The walls should be wiped down with a solution of bichloride of mercury 1 to 1000, the floor should be scrubbed with the same solution, and then, notwithstanding the skepticism prevalent, the room should be fumigated carefully by the burning of sulphur or by formaldehyde-vapor. This procedure may eventually be proved futile or unnecessary; but, just so long as many be-

PLATE XXI.



*The Lying-in Bed (showing the Permanent Rubber Sheet and Sheet, and over these the Rubber Sheet and Draw-sheet).*

lieve the process necessary in order to guard against contagion, it can do no harm to resort to it.

The simpler the appointments of the lying-in bed, the better. (Plate XXI.) The mattress should be covered with a large piece of rubber sheeting; over this the sheet is spread; a second piece of rubber sheeting covers this; and over this is placed the draw-sheet,—that is to say, a sheet folded a number of times on itself, on which the woman is confined. After the completion of the act of delivery the nurse or attendant simply pulls this folded sheet and the uppermost piece of rubber sheeting from beneath the woman, and at once, without specifically adding to her exhaustion, she lies in a clean bed.

We have already laid stress on the necessity, whenever possible, of the woman being watched with care during the process of gestation. If the urine has been examined at stated intervals, if the pelvis has been measured in order to determine the possibility of delivery at term, if the hygiene of the skin and of the intestinal canal has been attended to, the woman reaches term in a good condition to undergo, without undue strain, the physiological phenomena of labor. Immediately preceding the onset of labor the intestinal canal should be thoroughly cleansed by laxative and enema, because the normal mechanism of labor proceeds to best advantage when the rectal *cul-de-sac* is not loaded with fæces; and, again, because, during the expulsory stage, the crowding out of fæcal matter is annoying to the attendant as well as interferes with the requisite cleanliness. As soon as true labor-pains set in the external genitals should be washed with bichloride-of-mercury solution (1 to 5000) or with creolin solution (1 per cent.), and a vulvar pad should be applied. A similar pad should be worn during the progress of labor, being changed as often as it becomes saturated. Ordinary absorbent cotton, sewed in cheese-cloth bags, will answer admirably for pads at this time and during the puerperal state. The cheese-cloth should be boiled to remove the sizing, and after the pads are made they should be baked in an oven before use. The physician should not countenance the wearing of the old-fashioned napkin. Nowadays a material should be used which may be burnt after use, and the pads described are so inexpensive that their cost is hardly to be counted when compared with the additional cleanliness secured through their use. In the households of the very poor, where, of necessity, cloths of whatever nature attainable must be used, the attendant should be directed to boil them carefully before use. These precautions are absolutely necessary, in order to avoid infection, which, according to modern views, comes from contact.

The attendants should be scrupulously clean. Asepsis and cleanliness are synonymous terms. Both may be secured without resort to antiseptics, but, in order to leave no loop-hole for infection, which can but alter a normal, physiological act into a pathological, the latter must be used. Especially is this requisite if the physician has been or is in attendance on an infectious disease. The exigencies of a large general practice will not allow the physician to refuse to attend to cases of labor, but, in view of the truth of the assertion that the lying-in woman becomes septic, with rare exceptions, owing to the carelessness of some one of her immediate attendants, extra precautions are not alone requisite, but become the bounden duty of every conscientious man. These precautions take but little time, and the man who is not willing to give this time in order to safeguard a human life had better decline obstetrical work altogether. Complete change of clothing, washing of the hair and the beard, washing of the hands, and a full bath, before going from an infectious case to the lying-in woman, are the requisites. It matters not so much the kind of antiseptic used. The aim to be attained is cleanliness. The question of wearing rubber gloves is of importance. Generally speaking it is not necessary except from the standpoint that thus more complete asepsis may be secured. Since the only risk which the woman is subject to, aside from those dependent on the mechanism of labor, is contact infection, we feel that they should be worn, particularly if the attendant has recently been in contact with infectious material. The woman is entitled to every possible protection at the hands of her attendant, and to go a step further, the nurse should be obliged to wear gloves whenever she touches the genitalia, or the breasts. As before stated, the careless or the dirty nurse may ruin the most conscientious efforts of the physician.

The careless nurse is even more dangerous than the careless physician. From force of training he will always aim at a degree of cleanliness, while she, in her supreme ignorance, which in her opinion is often of greater worth than the knowledge of the physician, may go so far as to disobey his instructions. Fortunately, the puerpera who has been confined after an antiseptic manner, and who has been left clean, requires but little attention, the lack of precaution in regard to which might lead to infection. This is one of the advantages gained by the giving up of the systematic douching which characterized the puerperium of the past. These points will be dwelt upon in the chapter dealing with the puerperal state.

Every preparation should be made to meet the possible emergencies of labor. The well-appointed lying-in room should contain a bed-pan and douche-pan, a fountain-syringe, absorbent cotton, at least five yards of gauze, fluid extract of ergot or the preparation known as ergotole, anæsthetics (chloroform and ether), a glass, and a soft-rubber catheter. Of course, the amount of material present will depend, of necessity, on the means of the individual case. For the poorer class of patients the physician will probably have to furnish the cotton and the gauze, and possibly the ergot and anæsthetic, and often he will be obliged to dispense with the bed-pan and douche-pan. We are noting here the articles which ought to be obtained or furnished in order that the physician may be fully prepared to meet every possible complication. These articles must be carefully sterilized by heat and thereafter kept sterile. When summoned to a case, however normal it promises to be, the physician should at least carry his forceps with him, since he may frequently feel called upon to use this instrument to avoid maternal exhaustion or death of the fœtus. It goes without saying that the forceps will be rendered aseptic before use.

Whilst we have noted that it is desirable to have anæsthetics at hand, it by no means follows that they need always be used.

Much depends on the exigencies of the individual case. It is definitely settled now that anæsthesia during labor, administered as it will ordinarily be,—short of the surgical extent,—carries no risk to either the woman or to the child. On the contrary, we are enabled not only to spare the woman needless suffering, but also often to forestall impending maternal exhaustion and at the proper time to protect the integrity of the maternal soft parts. The questions to consider are the kind of anæsthetic which it is preferable to use and the time when we ought to resort to it. The belief, long prevalent, that anæsthesia tended to favor the occurrence of post-partum hæmorrhage, may to-day be disposed of by the statement that, unless it be given for a prolonged interval to the surgical degree, it does not interfere with the firm retractility and contractility of the uterus, which are desirable after the stage of placental delivery.

As a rule, chloroform is the best obstetrical anæsthetic except, possibly, where the administration is to be prolonged. In such a case ether should be selected, for the reason that accidents following its administration have been less frequent than after chloroform. These accidents, in all fairness it should be stated, are very exceptional during labor. The tendency to heart-failure and to respiratory failure is lessened during the parturient act, owing to the fact that the uterine contractions are constantly driving the blood to the brain through the heart, and, again, the efforts of the parturient necessarily entail free oxygenation of the blood. Such statements hold true, at any rate, for ordinary obstetrical anæsthesia, which is never pushed to the surgical degree. The woman always remains conscious of her surroundings; we are able, at a moment's notice, to relieve her of the influence of the anæsthetic; consciousness is never completely abolished, as is the case in surgical anæsthesia. And yet we accomplish a number of desiderata: We take the edge off the suffering, so to speak; we abolish, in a measure, reflex excitability,—which often nullifies the bearing-down efforts; we assist in the relaxation of the muscles of the pelvic floor and, even without resorting to surgical anæsthesia, we may relieve spasm of the uterine muscle; we are enabled often to save the integrity of the pelvic floor, which otherwise would inevitably have to yield to the applied pressure of the presenting part.

Anæsthesia given to the non-surgical degree does not abolish uterine or abdominal contractions, but, on the contrary, ether, in particular, at times, would seem to re-enforce them. At the moment when the presenting part is clearing the perineum, when the suffering is of the acutest type, the anæsthetic may be pushed to the surgical degree.

In case of operative interference we prefer ether. Under such conditions it is requisite to obtain anæsthesia of the surgical type, and it is unquestionable that then the safest anæsthetic is ether.

The more profound the anæsthesia, the greater the abolition of the contractions of the uterus and of the abdominal muscles and the longer it requires for the uterus to regain tone on emergence from the anæsthetic. Therefore, after the administration of an anæsthetic to the surgical degree, the greater the danger of post-partum hæmorrhage. It is wise, therefore, for the physician to have everything in readiness for the control of the hæmorrhage, should this occur.

As a rule, obstetric anæsthesia is called for only when the presenting part reaches the pelvic outlet. Then is the time when abolition of the contractions is desirable, for the double purpose of saving the woman the intense agony of the final expulsory act and the integrity of the muscles and the fascia which form the diaphragm of the outlet.

The rules for administering an anæsthetic to the surgical degree are identical with those which hold for anæsthesia in general. The presence of another physician is requisite in order that the respiration and the pulse may be noted *lege artis.* Ordinary obstetrical anæsthesia, being intermittent and never prolonged to the surgical degree, may be safely administered by the attendant himself or by the nurse. In emergencies, the woman herself may be allowed to anæsthetize, and a convenient method is the following: An ordinary goblet is packed with a handkerchief, the edges of the goblet are greased with oil or with vaselin to prevent the chloroform from trickling down and burning the face of the woman. The goblet is handed to the woman and she is instructed to hold it over her mouth and her nose during the acme of the contraction. This takes the edge off her pain, and, in case she takes enough of the anæsthetic to abolish reflex action, the goblet at once drops from her hand and any risk of over-anæsthesia is avoided. It is dangerous to hand the woman a handkerchief on which the chloroform has been poured, for, in the event of the anæsthesia suddenly becoming deep, the handkerchief will drop on her face, and, if the attention of the physician is required for the conduct of the delivery, the woman may take too much of the anæsthetic. As a general rule it may be stated that, whenever possible, a physician should be present to give the anæsthetic.

The minor anæsthetics, or, rather, analgesics, of utility during labor are chloral and opium or its alkaloids.

Chloral has a place of great value in obstetrics. Whilst it is not an analgesic in the true sense, it certainly gives decided relief. During the first stage of labor, when the pains are nagging and in so far ineffective, the administration of chloral in 15-grain doses, repeated half-hourly for three doses, regulates the contractions of the uterus and thus gives the woman a period of rest during the pains. The interval between the contractions is lengthened and the pains are intensified, the uterus regaining tone during the longer intermissions. It has been claimed that this drug has a direct effect in causing a rigid cervix to soften and, in so far, to dilate with greater readiness. This is questionable, but it is certainly true that rigidity of the cervix will often yield under the effect of the drug, although the true explanation probably is that, owing to the regulation of the contractions, the intensity is greater, and therefore the dilating effect is increased.

Chloral is also of value for the control of the false pains which typify the precursory stage of labor, and acts admirably in allaying the suffering caused by the after-pains of the puerperal period. Opium and its salts should rarely be used in labor or the puerperal state. The aim is to secure physiological action of the intestinal canal after labor and during the puerperal period, and if opium is administered there is likelihood of intestinal peristalsis being checked. The chief value of opium is to allay reflex nervous excitability, and if other means fail, and the woman is becoming exhausted from the ineffective character of the contractions, this drug holds out a means of relief by giving the woman a period of sleep, during which the irritability of the uterus may be checked, with the result that the contractions become rhythmical and natural. Codein is the form in which opium had better be used. It has not the same inhibitory effect on the peristalsis of the intestine that opium and morphia have, and yet, if administered in sufficient dosage it is as speedy in effect. The dose of codein is larger than is generally recognized. Thus, it is safe to administer $1\,^1/_2$ grains by mouth and 3 grains by rectum.

In obstetrics, as elsewhere, opium is the best remedy of all for the relief of deep shock. After the completion of tedious labor where the pulse is rapid and the woman is in shock—to a degree—reaction may best be secured through the administration of an hypodermic injection of morphia. Barring this exception, it is wise to remember that that puerperal state will be the smoother in which the administration of opium has been avoided, and that certain possible complications of this state are most amenable to treatment where the woman has not been saturated with opium for the relief of symptoms which will ordinarily yield to chloral.

The first duty of the physician when called to a case of labor is to satisfy himself that the presentation is a normal one. If he has been engaged beforehand he has familiarized himself with the configuration of the pelvis according to the rules laid down under the subject of "Pelvimetry," and therefore knows that, so far as the pelvis is concerned, there is no obstacle to the progress of labor after the normal mechanism; or, in case he has determined pelvic contraction or abnormity, he is in a position to take advantage of those measures which the character of the deviation from the normal demands. If he has not been engaged beforehand, his duty is to study the pelvis and to make up his mind if it is of sufficient capacity to enable the woman to deliver herself unaided. On the acquiring of this knowledge will depend the regulation of his own movements as well as the safety of the woman and the child. In the case of a primipara, where the pelvis and the presentation are normal, it is not desirable that the physician should remain in immediate attendance, but, having assured himself and his patient that all is right, he may safely attend to his other duties in the knowledge that a certain length of time must elapse before his immediate services will be required. He may, therefore, leave his patient with the nurse, and thus avoid causing unnecessary anxiety in the mind of the patient, as well as be spared the constant questioning to which he will be subjected if he remain in the house. The lying-in room should be left to the patient and her nurse. The presence of anxious relatives has a demoralizing effect on the woman, and also uses up the oxygen in the room which she needs in order to go through her ordeal in the best possible condition. A few quiet reassuring words from the physician, especially if his manner be calm and his appearance free from anxiety, will do much to give the patient confidence in her ability to pass through her ordeal in safety.

The physician, having scrupulously disinfected his hands, proceeds to determine the presentation. And first a word as to the proper method of disinfecting the hands. They should be scrubbed for five minutes under hot running water with tincture of green soap; next for a similar period in 60 per cent. alcohol, and then immersed for the same period, in a 1 to 2000 solution of bichloride of mercury. Afterward they are rinsed in sterile water or sterile salt solution. The woman lies on her back, the abdomen being covered by a thin sheet, and palpation determines the attitude of the fœtus. Above the brim in multiparæ, and a trifle below it in primiparæ, the palpating hand will detect the head or the breech unless the shape of the uterus—transverse—certifies that the presentation is transverse; in which case no presenting part will be determined at the superior strait. The hands next palpate the lateral walls of the uterus to determine on which side there is the greatest resistance, due to the dorsum of the fœtus. Next, the listening ear makes out the point of maximum intensity of the heart-sounds, as also their rhythm. The presentation having been determined, the next step is to make the vaginal examination, which enables the physician to satisfy himself in regard to the progress of dilatation and the position of the presenting part.

The hands having been again carefully rendered aseptic, and the external genitals of the woman having been similarly disinfected, the physician separates the vulvar cleft with the thumb and the index of one hand and introduces the index or the index and the middle fingers of the other hand into the vagina, depressing the perineum as much as is possible in order to be able to reach the cervix, which, during the first stage of labor, owing to the approach of the body of the uterus to the anterior abdominal wall, is apt to be in the sacral excavation. This method of inserting the finger is preferable to that generally followed, where the finger finds its way into the vagina by being swept from the anus into the posterior vulvar commissure, since it is, above all things, necessary to carry no infectious material into the vagina, as is likely if the woman has involuntarily defecated between the cleansing of the genitals and the insertion of the finger. The examining finger takes note of the degree of engagement of the presenting part and of the condition of the cervix. If active labor-pains have been present the cervix will be found somewhat dilated, and if the finger be left in the vagina during a contraction the membranes will be found to bulge during a pain. During a contraction care must be taken not to rupture the membranes, since on their integrity during the first stage of labor rapidity of dilatation depends, particularly in case of presentation of the pelvic extremity.

If the membranes be thin and dilatation has progressed sufficiently to enable the finger to reach the presenting part, then, in the interval of .. contraction, an attempt may be made to determine the landmarks of the presenting part which lead to the differentiation of the position, such as the fontanelle and the direction of the sagittal suture in case of presentation of the cephalic pole, the coccyx and the intergluteal cleft in case of the pelvic extremity, etc. As a rule, however, until dilatation has progressed one-half,—that is to say, until the cervix has dilated sufficiently to permit of exploration without much risk of rupture of the membranes,—if the pelvis is normal, and if the presentation is of the type which ordinarily causes no anxiety—vertex or breech—the physician at this stage may rest satisfied with the information secured. He may then inform the woman and relatives that everything is progressing satisfactorily and that he will return in a variable interval of time, according to the determined degree of dilatation. When asked, as he will be, how long labor will last, he must never commit himself to a definite time, since, in the most normal case, the contractions may suffer arrest and the labor be protracted. The best answer to give is that everything depends on the frequency of the contractions and that it is simply impossible to state a time. Before leaving he should inform the nurse of his movements, so that he may be notified in case a complication arises.

During the stage of dilatation the position of the woman may vary according to her inclination. It is better that she should not assume the recumbent position, since the contractions of the uterus act to better advantage if she be erect or sitting; and then, again, she bears the pains to better advantage. She may eat and drink what she pleases, chloral being ordered, in case of nagging pains or nervous excitability, in the dose of 15 grains every hour or half-hour for three or four doses.

It will be remembered that during the first stage of labor the contractions are purely involuntary, the abdominal muscles being ineffective prior to rupture of the membranes and full engagement of the presenting part. The woman should, therefore, be directed not to waste her strength in futile bearing-down efforts. In the event of the contractions being regular, rhythmical, and yet the cervix remains rigid, a valuable means of assisting dilatation is the hot douche. This should be administered under perfect aseptic precautions. Sterilized water at a temperature of 110° F. may be used, to which creolin may be added to make a 1-per-cent. solution. Bichloride of mercury had better be avoided, since a large quantity of water will be necessary and the risk of poisoning should be borne in mind. At least four quarts of water should be used and the douche should be repeated at half-hourly intervals. This hot douching, aside from favoring dilatation by directly assisting in the softening of the rigid cervical muscles, also intensifies the uterine contractions.

Where, notwithstanding these measures, the pains remain ineffective and become nagging in character, the physician, having satisfied himself that the pelvis is normal, should think of the possibility of the position being an unfavorable one. It will be remembered that obliquity of the uterus will interfere with proper dilatation, since the contractions cannot act in the axis of the plane of the superior strait. Such obliquity may be corrected by the application of a bandage, underneath which is placed a pad at the side toward which the uterus inclines; or the woman may be directed to lie down on the side opposed to the inclination of the uterus. Should this anomaly be rectified and still dilatation does not progress, or the contractions assume the nagging type, the time has arrived for determining the exact cause, for it is, above all, necessary that the woman does not become exhausted in fruitless efforts. A very common cause of faulty dilatation and of nagging, ineffectual pains is the lack of engagement of the head, owing, possibly, to a tendency to extension at the brim or to a posterior position of the occiput.

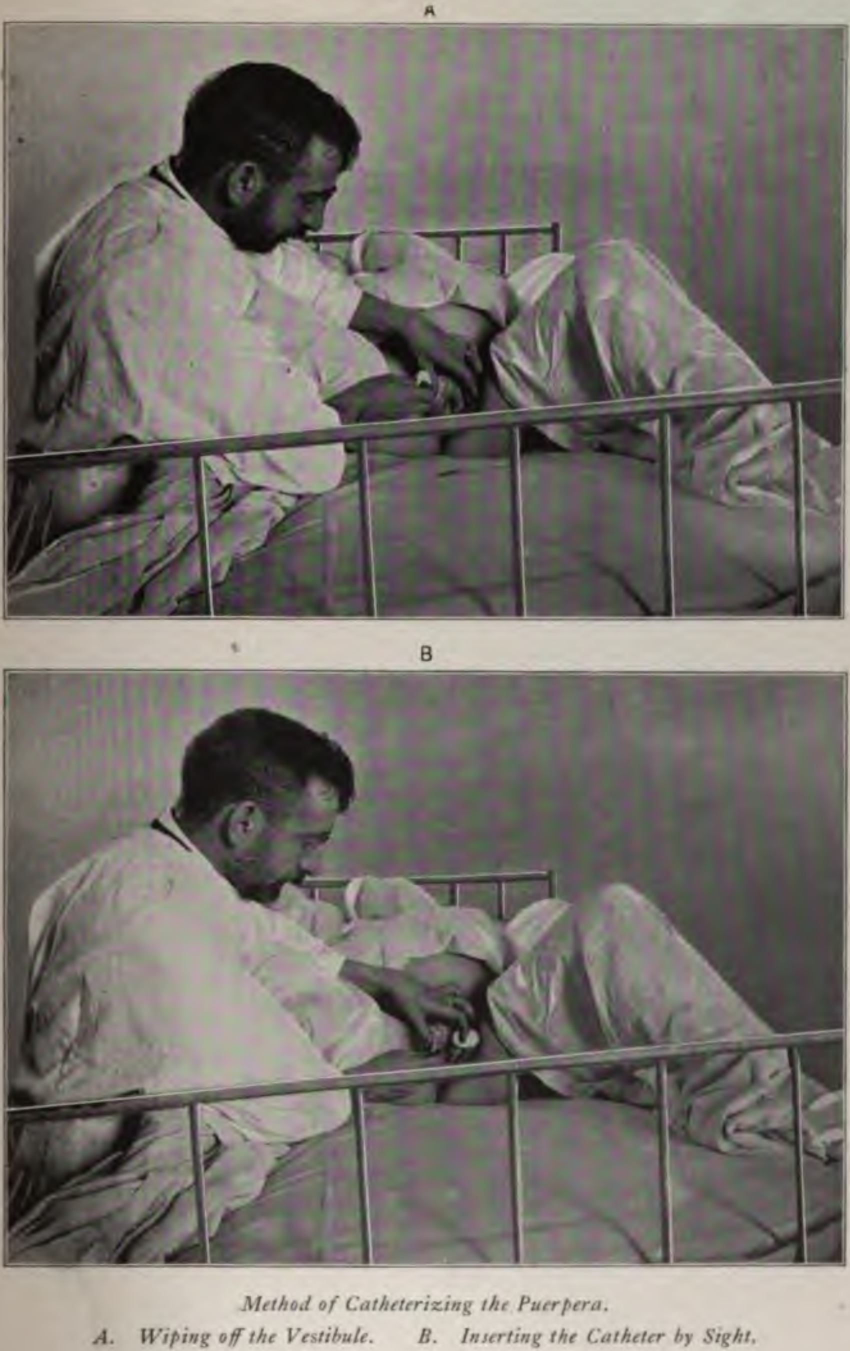
Exact diagnosis is now requisite, and if on digital examination the physician is unable to make out the position, the insertion of the entire hand into the vagina is necessary, under anæsthesia. This procedure enables the diagnosis to be certified, and at one and the same time the measures for remedying the faulty position may be resorted to. These deviations from the normal course of labor will be considered in the section devoted to the consideration of the course and the management of abnormal labor.

The physician repeats his visits, and, each time under careful asepsis, makes his examination, until the stage of dilatation is completed or the membranes have ruptured. Just so long as there is no evidence of maternal or of fœtal exhaustion, and just so long as the clinical course of labor is proceeding after the normal fashion, the physician's policy is a waiting one, and his immediate attendance is not requisite; on the contrary, his presence in the lying-in room simply excites the anxiety of the woman. As a rule, the diagnosis of position and of the capacity of the pelvis having been determined as normal, the fewer the examinations, the better. No matter how careful we are in our asepsis, each examination carries the risk of infection.

When dilatation has become complete or when the membranes have ruptured, the physician should remain in the house, especially if the woman be a multipara. The second stage of labor not infrequently is very rapid, and the services of the physician may be needed at any time. Interference will rarely be called for, unless the woman or the fœtus gives evidence of exhaustion, just so long as the presenting part is undergoing the normal mechanism of descent and engagement. The position of the woman during the second stage of labor, especially when the presenting part has reached the pelvic floor, should be recumbent on the side or on the back, according to the preference of the accoucheur. The dorsal position, in the vast proportion of cases, is the preferable one for delivery, —the woman lying across the bed, her nates at the edge. The abdominal muscles now coming into play, the woman may assist herself by bearing down, and such effort is more effective if she can make traction on the hands of the nurse or on a fixed object, such as a sheet tied to the bed, and if also she can press her heels against the edge of the bed or against two chairs. In case of great rigidity of the pelvic floor and a tendency of the presenting part not to recede during the interval in the contractions, it is advisable to place the woman in the lateral position, when the presenting part is less likely to exert undue pressure on the pelvic floor.

During this second stage of labor the bladder should be emptied at intervals, whenever possible through the voluntary efforts of the woman, or, if she cannot, she should be catheterized, always by sight after precedent cleansing of the introitus of the vagina. (Plate XXII.) A distended bladder will interfere with descent of

*PLATE XXII.*



*Method of Catheterizing the Puerpera.*
*A. Wiping off the Vestibule. B. Inserting the Catheter by Sight.*

the presenting part, aside from the risk of rupture of the bladder under the forcible expulsory efforts.

A frequent cause of delay in this stage, when otherwise everything is normal, is non-retraction of the anterior lip of the cervix. This lip becomes excessively œdematous and bulges down in front of the presenting part, thus interfering with descent. The remedy is to push this lip over the presenting part in the interval of a contraction and to maintain it there during a contraction.

At times, after rupture of the membranes, the tone of the uterus apparently gives out and the inertia is complete. Obviously the child is apt to suffer if such inertia be allowed to continue, and the effect on the woman of such delay in the progress of the labor is bad. There are a number of things which may be resorted to for recalling the contractions. Massage of the uterus will at times prove successful. The administration of quinine in large doses, such as 20 grains by the mouth or 30 by the rectum, occasionally appears to evoke contractions. An excellent oxytocic, and one always available, is the administration of a saturated solution of sugar, in teaspoonful doses, every few minutes. Should these measures fail and the woman show evidence of exhaustion or the fœtal heart point to a similar condition impending, delay is no longer advisable, but the physician must apply the forceps as is indicated in the chapter dealing with this instrument.

Descent and rotation having occurred, we pass to the consideration of the management of the final stages of the expulsory phenomena. When the presenting part reaches the pelvic floor, undergoing the normal mechanism, the resistance to be overcome is that which is offered by the muscles and the fascia of the introitus of the vagina. This resistance must yield after a gradual manner, else the structures will be damaged. Relaxation and retraction must occur and the accoucheur may materially assist by retarding progress of the presenting part and by maintaining the proper relation of this part to the diameters of the outlet. Whenever there does not exist disproportion between the object which aims to emerge and the parts through which this object must pass, the line of action is as follows: Let us take, for example, the most frequent position of the vertex: Rotation occurs so as to bring the occiput under the pubes. We have noted that the shortest diameter of the fœtal head is the suboccipito-bregmatic, and that this engages in the antero-posterior diameter of the outlet. The head must remain well flexed in order that its favorable diameter may offer in this diameter of the pelvic outlet. Further, in order that the head may emerge without damaging the maternal structures, slow extension must take place. The cardinal points to remember, therefore, are that extension must be delayed until the suboccipital point has become fixed under the pubes, and that then, and only then, extension after a gradual fashion should be allowed. (Plates XXIII, A and XXIII, B.)[1] The teaching of "support of the perineum" has been of great harm as regards the maintenance of the integrity of the maternal soft parts. It is not the perineum which needs support. It is the head which must be delayed in its progress until the muscular structures have relaxed, as they inevitably will unless diseased, and extension must be prevented until the proper diameter of the head has engaged at the outlet under the pubic arch. If anything is to be "supported" it is the fœtal head, and the support given is in the line indicated. In the normal case the perineum need not be touched. Reference to the plate shows how the thumb of the attendant is delaying advance and, at the same time, promoting flexion until the structures have yielded and until the suboccipital point is engaged under the pubes. This accomplished, the patient is anæsthetized momentarily to the surgical degree, and, in the intervals between the pains, the head is shelled out over the perineum. In case, for one or another reason, it is inadvisable to administer an anæsthetic to the surgical extent, the woman is counseled to avoid all expulsory effort. She is told to open her mouth and to call out during a contraction, thus nullifying

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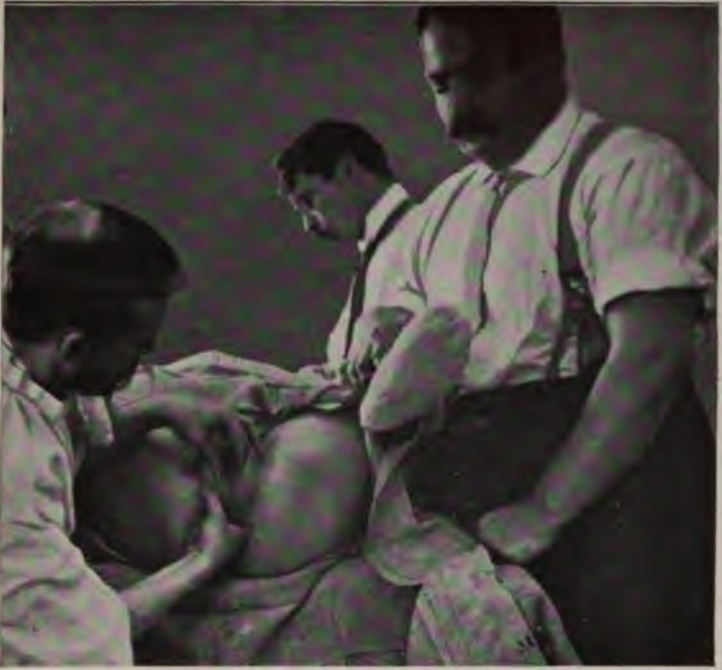
[1] These Plates are faulty in that the finger is represented as being in the rectum. They represent something which should never be done unless the hand is protected by rubber glove. Again, by maintaining flexion of the presenting part through pressure exerted on it by the fingers, extension takes place after a gradual fashion, thus allowing the muscles of the pelvic floor to relax as every other muscle in the body must and does after pressure. Extension takes place *slowly*.

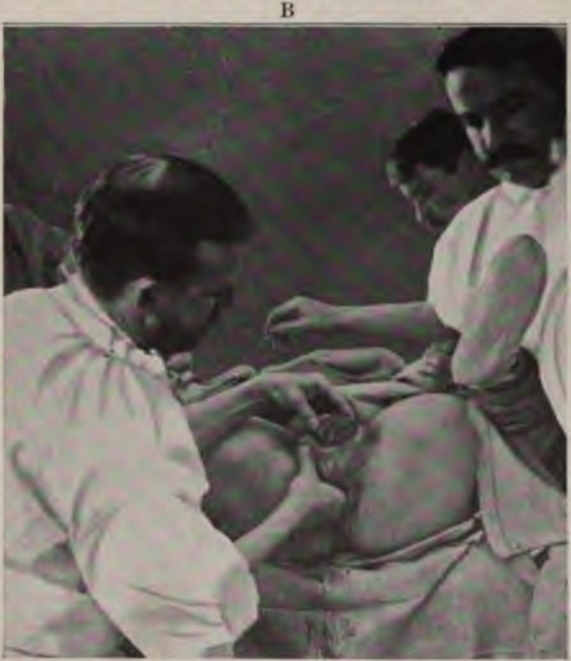
*PLATE XXIII.*

A



*Maintaining Flexion. The Index in the Rectum Presses on the Fœtal Chin, whilst the Index and Thumb of the Other Hand Press the Sinciput Downward and Backward*

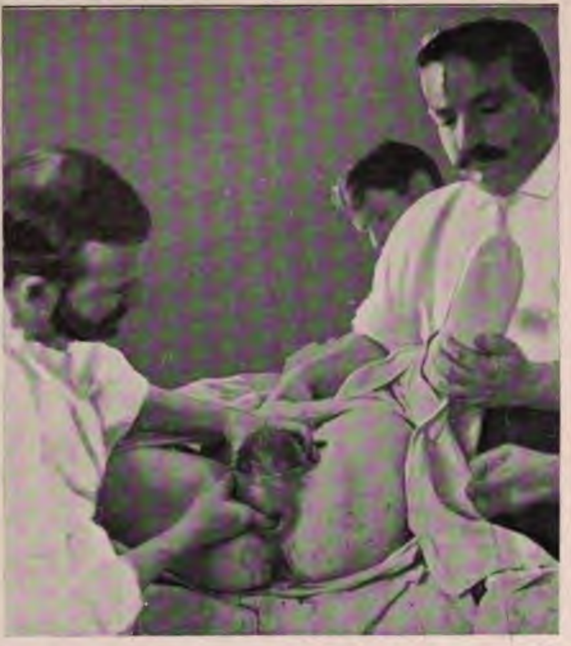
B



*First Stage of Extension. The Suboccipital Point Having Engaged Under the Pubic Arch, the Chin is Allowed to Leave the Sternum.*

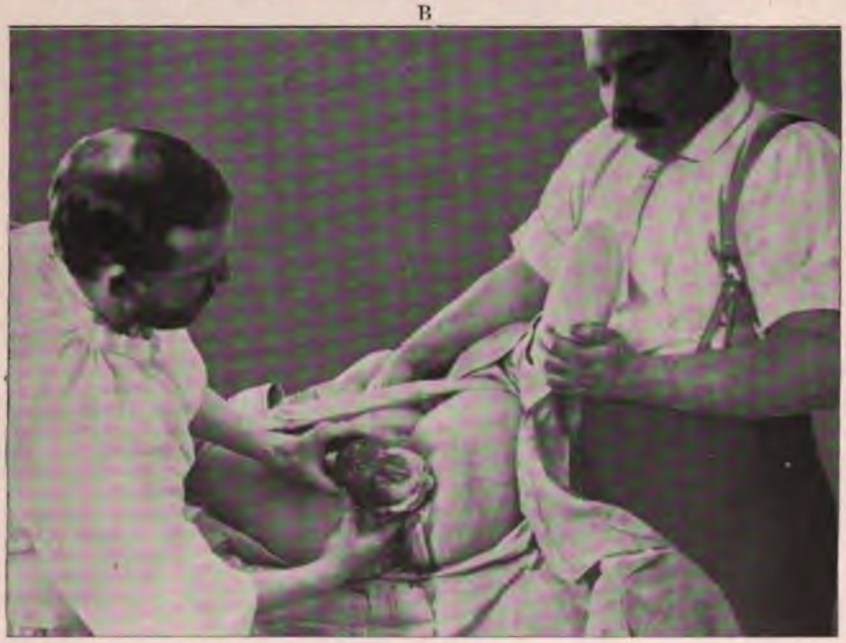
# PLATE XXIV.

A



*The Head is Gradually Extending; the Perineum is Retracting and Relaxing.*

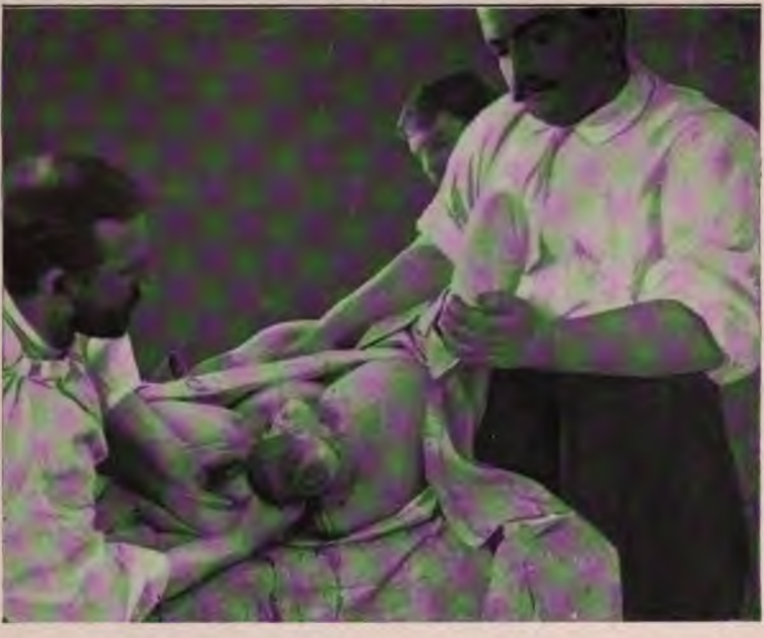
B



*External Rotation, or Restitution.*

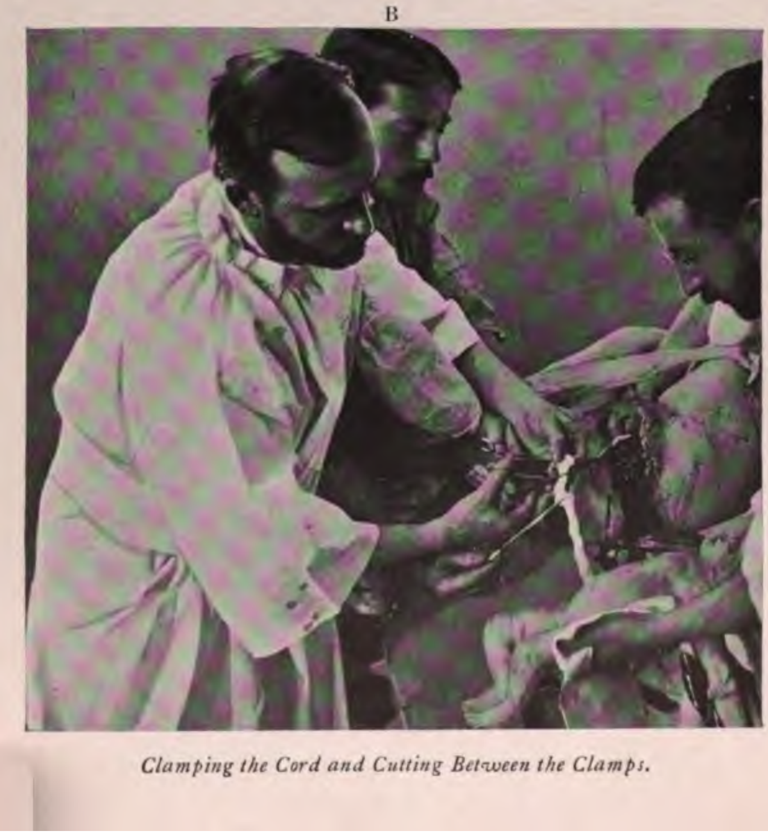
## PLATE XXV.

A



*Delivery of the Trunk. The Anterior Shoulder Emerging from Under the Pubic Arch.*

B



*Clamping the Cord and Cutting Between the Clamps.*

the effect of the abdominal contractions, and then the head may be gradually peeled out over the pelvic floor. (Plate XXIV, A.)

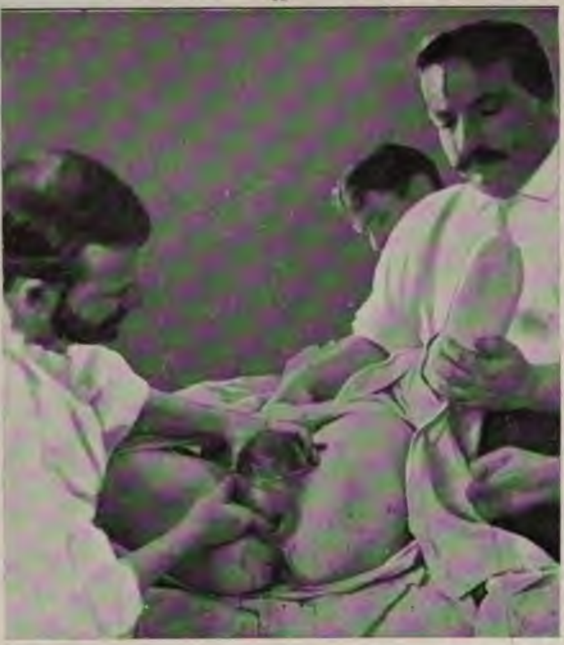
The methods still figured of the "support of the perineum" should serve as warnings what not to do. The thumb applied to the head and, if need be, the index finger inserted into the rectum, in order to enable the extension to be of the most gradual type, is the proper way to deliver the head, under normal circumstances.

Stretching of the muscles of the pelvic floor should be avoided, since such action leads to increase in the action of the uterus and to spasm of the muscular structures of the floor.

The head having been shelled out over the perineum, it is supported in the hand until external rotation, or restitution, takes place. (Plate XXIV, B.) Next the shoulders must be delivered without lesion of the maternal soft parts. Under the normal mechanism, with which, at the present, we are alone concerned, the shoulders rotate antero-posteriorly, the anterior becoming fixed under the pubic arch and the posterior sweeping over the pelvic floor and out at the posterior commissure. When the head has been delivered the nurse follows down the fundus of the uterus or the physician does so with his disengaged hand. The object of this is to cause the uterine walls to remain in close apposition to the fœtus,—a point of exceeding importance in case of presentation of the pelvic extremity, since thus extension of the arms above the head is prevented. In case of inefficient contractions after birth of the presenting part it is necessary to re-enforce them, since, the presenting part being in the world, the life of the fœtus may become imperiled through pressure exerted on the umbilical cord. Whilst, therefore, it is wise to await the recurrence of normal contractions, in the event of these being delayed, the attendant, by pressure over the fundus of the uterus, may assist in the expulsion of the remainder of the fœtus, this pressure being aided by traction on the portion of the fœtus which is in the world, such traction being made in the axis of the pelvic outlet,—that is to say, directly downward. (Plate XXV, A.) In case of further delay, the finger inserted under the pubic arch or over the posterior commissure, according as one or the

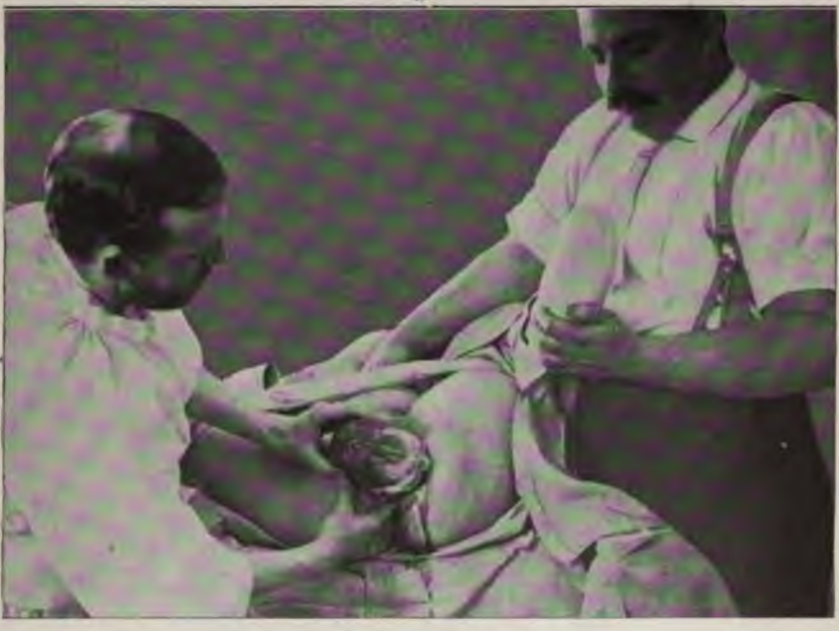
PLATE XXIV.

A



*The Head is Gradually Extending; the Perineum is Retracting and Relaxing.*

B



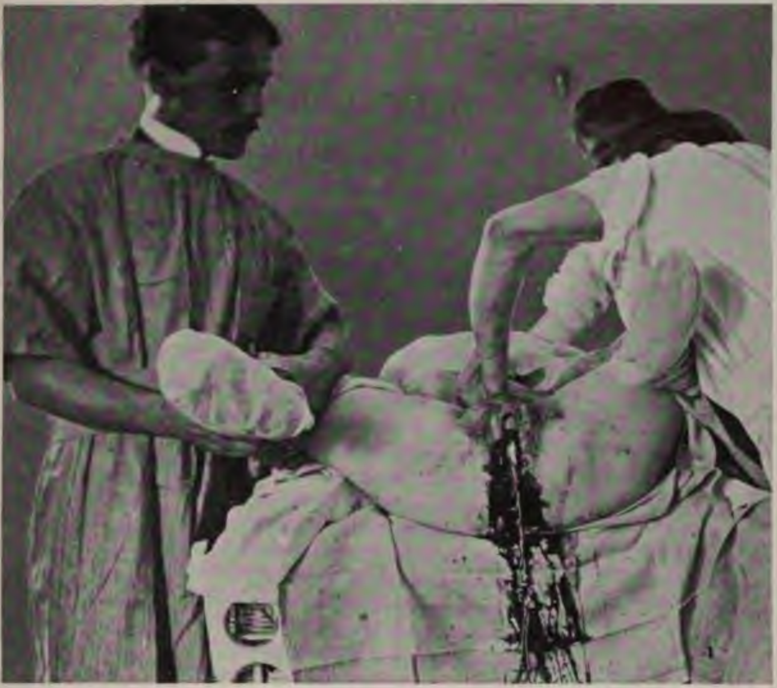
*External Rotation, or Restitution.*

the uterine walls retract, squeeze down upon the placenta, and drive it into the vagina. The course for the attendant to pursue is to keep his hand on the uterus for a few minutes to guard against undue relaxation, and then, when the uterine globe is felt to harden under the hand, to assist in the expulsion by the method of manual compression, which is known after Credé, who first systematically described it. (Plate XXVI, A.) The procedure is as follows: The radial surfaces of the hands are applied at the fundus of the uterus, the palms of the hands resting over the body of the organ, the thumbs meeting in the midline. When the uterus is felt to harden, pressure is made by both hands in the direction of the plane of the pelvic inlet. Thus the muscular force of the hands of the physician is added to the contractions of the uterus, and often, at the first attempt, the placenta is not only expelled from the uterus into the vagina, but out of the vagina into the bed. Rarely, however, is the first attempt successful. Where it fails, the attendant keeps his hands in position and awaits a second uterine contraction. Should this not tend to recur, or should it be feeble, gentle massage of the uterus will often evoke stronger contractions. Patience is requisite and the uterus should not be spurred into action before it is ready to act,—that is to say, before it has regained tone. Usually from fifteen to thirty minutes elapse from the termination of the second stage of labor until the end of the third stage. This is entirely within physiological limits, and if no complication offer, such as hæmorrhage, delay to this extent need give rise to no anxiety.

As the placenta emerges at the vulva it is received in the hand and held there until the membranes are shed. (Plate XXVI, B.) In normal cases the membranes follow the placenta at once, but frequently, after the uterus has expelled the placenta, the lower uterine segment contracts and the membranes are nipped. This is particularly apt to occur where attempts have been made to hurry the third stage or where the uterus has been irritated by overzealous massage. In the event of the membranes becoming caught as described, the policy to pursue is to allow the uterus to relax a trifle, when, without difficulty, the membranes emerge. The teaching,

## *PLATE XXVI.*

A



*Manual Expression of the Placenta.*

B

*Delivery of th*

that when the placenta has been delivered the membranes should be rolled into a cord in order to enable their extraction intact, is a common cause of so-called retention and "morbid adhesions" of the membranes. The fact is that, when the membranes are twisted, if the internal os should close down a portion of the membranes are inevitably torn off. Adherent placenta and retention of the membranes become very rare as the physician familiarizes himself with the proper conduct of the third stage of labor. Such occurrences are due either to pathological changes at the placental site or else the adhesion and the retention is only apparent, the placenta having become detached or the membranes being torn off by the method of delivery and remaining incarcerated in the uterus through the shutting down of the lower uterine segment.

It will be noted that we have avoided referring to a prevalent method of placental delivery,—traction on the cord. This method is to be rejected on the ground that resort to it is unnecessary, and that it may prove dangerous. When we recall the normal mechanism of placental expulsion it is apparent how futile traction will be before separation of the placenta at the serotina has occurred. If the attachment be a firm one, what is needed is patience in order to await the natural separation which is an associate of the natural retraction of the uterus. Traction will simply irritate the organ, and, should it be forcible enough to cause detachment in advance of the normal mechanism, the venous sinuses of the uterus will not have a chance to close after the requisite normal fashion, and the woman becomes subject to the risk of hæmorrhage. After normal separation of the placenta traction on the cord may certainly be effective in the delivery of the placenta, but resort to such a method is unnecessary, since the normal mechanism is sufficient. Further, in a given case we are never aware that the placenta is not adherent, and, if we make traction under such circumstances, the effect is simply to pull off a portion, or else, if the uterus be atonic, to pull down the site of placental implantation, and thus to favor inversion of the uterus. It may be laid down as a cardinal rule that, if the placenta cannot be expelled within a reasonable interval by the natural powers, assisted by manual compression, it is adherent, or else that it is incarcerated above the lower uterine segment, in which event traction on the cord is also bound to fail in effecting delivery, and manual extraction will be necessary. Just so far as the normal mechanism of the shedding of the placenta is borne in mind, and just so far as the physician is familiar with the manner of application of Credé's method, just so infrequently will he resort to extraction of the placenta through traction on the cord. When the uterine globe is felt to harden effectually, becoming smaller and remaining so, then, if the placenta has not appeared at the outlet, the inference is allowable that it has simply been expelled into the vagina. In such an event the examining finger will detect it in the vagina, and then traction on the cord is allowable to remove it from this passage.

When the uterus has been emptied it ordinarily will contract into a hard mass like a cricket-ball; but for some time it is very apt to undergo relaxation, and therefore the golden rule to keep the hand on it for at least one-half hour after delivery, in order to guard against relaxation and post-partum hæmorrhage.

After the delivery of the placenta and membranes they should be carefully examined in order to determine if they are entire. Not alone should the fœtal surface be looked at in order to be assured that the two layers of the amnion are present as well as the chorion, but the maternal surface should be most carefully scrutinized in order to detect absence of a cotyledon or deficiency in a large part of the placenta. This precaution should never be neglected, since the normal course of the puerperal state depends on the absolute emptying of the uterus. In the event of there being any doubt as to the integrity of the placenta or the membranes, then the interior of the uterus should be at once explored. Under strict aseptic precautions the hand is inserted into the uterus, the organ being depressed as much as possible by the other hand. The cavity is carefully explored and whatever remnant is found is removed. It is far easier to explore the interior of the uterus after this fashion immediately after labor, when the vagina and the uterus are wide open, than a number of days afterward, as will become necessary if the retained remnants are not detected until symptoms of septic infection set in. All that the physician need remember is the necessity of absolute cleanliness and of gentle manipulation.

When satisfied that the uterus is empty, ergot should be administered, in the dose of 1 drachm, by the mouth. The necessity for the administration of ergot is disputed. Unquestionably, under physiological conditions, the uterus will contract after delivery and remain in that state of contraction which is so essential to the smooth course of the puerperal state. But women rarely approach labor or pass through it in a strictly physiological manner. As a rule, under the pressure of our high civilization, nervous strain is exaggerated during pregnancy and intensified during labor. The result is that the contractility and retractility of the uterus stand in need of re-enforcement, as it were, and this may be secured through the administration of ergot. The drug can do no harm, and extended experience would seem to prove that its administration, after the completion of the third stage of labor and during the first few days of the puerperal period, assists in maintaining due contraction and thereby hastens involution. This, however, is the only time when ergot should be given. During labor it has no place. We possess far safer means of accelerating deficient contractions, and, if an indication offer for the speedy termination of the labor, the minor operative measures, being under the control of the physician, are far safer for the woman than the action of a drug the property of which is to set up and to maintain contractions in a manner often beyond our control. The distinctive property of the drug should ever be borne in mind. If administered during labor it may at once lead to the speedy expulsion of the child, but it may also lead to tetanic spasm of the uterus, whereby the life of the fœtus is imperiled, and whereby, also, should operative interference become necessary, this is nullified or rendered dangerous, owing to the spasm which has been evoked. Further, ergot administered during labor may affect chiefly the lower uterine segment, and the fœtus becomes incarcerated, or, the upper segment remaining rel hæmorrhage may ensue, which will kill the child and excessively endanger the woman.

After the expulsion of the placenta there occurs a loss of a variable amount of blood, the overflow, as it were, from the uterine sinuses. This is physiological, and, as a rule, the uterus contracts and remains so, the further loss being the lochia, which is a discharge consequent on the involution of the uterus. Where the labor has been protracted or where it has been necessary to resort to surgical anæsthesia, the loss of blood may be considerable, leading to what is termed post-partum hæmorrhage and constituting one of the most alarming of obstetrical complications. This post-partum hæmorrhage may set in immediately after the completion of the third stage of labor or a number of hours afterward. Even at a still later date hæmorrhage may occur,—called secondary post-partum hæmorrhage; but such an occurrence is due, usually, to the presence of a foreign body in the organ, such as a portion of the placenta, and is not dependent on atony of the organ, as is the type of bleeding we are now considering.

Post-partum hæmorrhage is caused by deficiency in the contractility and retractility of the uterus. Long-continued labor; exhaustion of the woman; sudden termination of the labor, especially of the placental stage; the presence of a tumor, such as a fibroid, in a segment of the uterus leading to unequal contraction,—such are the causes of post-partum hæmorrhage. Where nerve-tone is at par, and the woman has passed through her labor after a physiological manner, and the uterus has been absolutely emptied of all remnant of placenta and of membrane, the occurrence of hæmorrhage is excessively rare; still, after every case, the possibility should be borne in mind and the physician should be prepared to meet the complication.

The minor bleeding may be met by the administration of ergot by the mouth or hypodermically, and by gentle massage of the uterus. The source of the hæmorrhage should be carefully differentiated. It should be borne in mind that profuse hæmorrhage may come from a lacerated cervix through involvement of the circular artery or from extension of the rent higher up into the broad ligament. Of course, the treatment of such a lesion will be vastly different from that of oozing from the uterine sinuses. Under aseptic precautions, therefore, the first step in every case is to investigate the cervix. After labor the margins of the cervix are flabby and in contact with the vaginal walls, and, therefore, the simple vaginal touch is uncertain in making the diagnosis. The woman being on her back, the cervix should be seized between the thumb and fingers and brought down to the introitus of the vagina, when, under inspection, the extent of the lesion, if any exist, may be determined. It can then be repaired after the method described in the chapter dealing with "The Surgery of the Puerperium" ("Obstetric Surgery"). If this source of hæmorrhage has been excluded, then, unless the bleeding be profuse, the milder methods may be tested for controlling it. Such methods are: massage of the uterus and the hypodermic injection of ergot; the injection into the uterus of water at a temperature of 115° F.; the insertion of ice. These are the only measures we can approve of. In a strict emergency, where the physician is not prepared with all that is requisite, the injection of vinegar into the organ is allowable, but we unqualifiedly condemn the use of iron. Iron injected into the uterus, in the form of the subsulphate, is without question a powerful styptic, but the clots which are formed are very liable to decompose and septicæmia is a likely result of its use. Besides, to-day there is no excuse for the use of iron or iodine or other styptic. We have seen that amongst the things which should be in the well-prepared lying-in room is sterilized gauze, and it is a good rule for the physician to carry such gauze with him whenever he is summoned to a case of labor.

If the milder means of checking post-partum hæmorrhage through evoking uterine contractility and retractility fail,—such as the hot intra-uterine douche, massage of the uterus, and the injection of ergot,—then the time has come for resort to the one certain means of controlling the hæmorrhage, and this is the intra-uterine tamponade. But little time should be lost in resorting to this measure, for the woman, exhausted by the efforts of delivery, cannot stand the loss of much blood, and, if we dally overlong she may sink into collapse or lose enough to pass into a condition of acute anæmia often of a rapidly fatal type.

It has been proved that the intra-uterine tamponade is not alone effective, but safe. It was feared that the hyperdistension of the uterus caused by the firm tamponade would interfere with retraction after the removal of the tampon. This, however, has been proved a groundless fear. The uterus, as a rule, contracts firmly when the tampon is removed, and remains contracted. Should there be any tendency to permanent relaxation it is a simple matter to tampon it again.

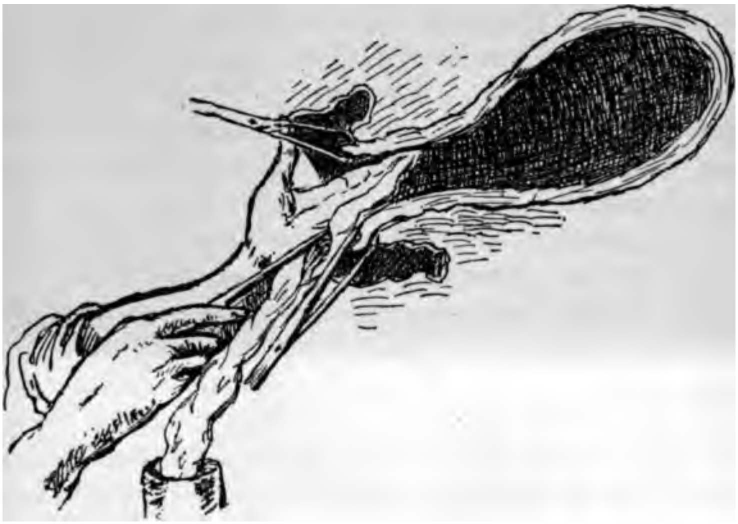


Fig. 21.—Tamponade. (*After Dührssen.*)

The gauze for purposes of the tamponade should be two inches in width, and fully five linear yards will be needed. It must be emphasized that this gauze must be sterile, and, further, that every step of its insertion must be sterile. After labor at term, where the uterus is wide open, as it is customary to find it in case of hæmorrhage due to want of tone, it is a simple matter to pack this gauze in the uterus by the hand, the other hand controlling the organ through the abdominal wall. What we are aiming at is control of the bleeding through compression of the bleeding-point, so to speak, and, therefore, the uterine cavity must be packed full and the upper vagina as well. This packing may be left in for at least thirty-six hours, when, under careful asepsis, it is removed, and, if the uterus is still atonic, the cavity is washed out with hot sterilized water and a new packing inserted. Whilst the gauze is in place the chances are that the woman will have to be catheterized, and this should be done by sight after careful precedent cleansing of the vestibule.

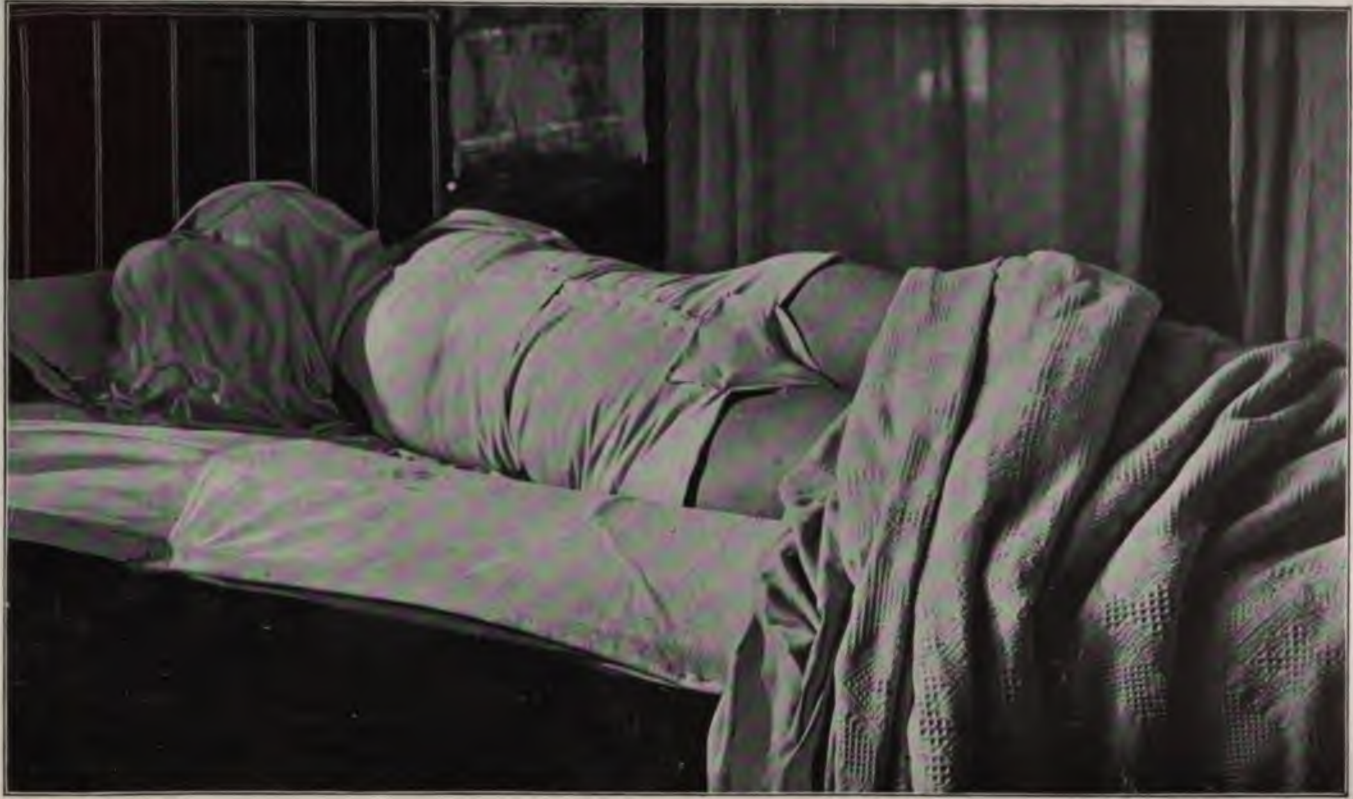
In order to counteract the anæmia caused by loss of blood the usual methods of stimulation should be resorted to, such as whisky or brandy, hypodermically; strychnia, $^1/_{16}$ grain, hypodermically, repeated hourly for three or four doses; but the best means of all for restoring the quality and the quantity of the blood is resort to hot saline infusion. In conditions of acute anæmia it is a very difficult matter to resort to venous infusion, since it is hard to find the calibre of the collapsed vessel and the apparatus is never at hand. It has been found that injection of 1-per-cent. hot saline solution into the cellular tissue of the back or abdominal wall is very effective, and a number of pints may thus be given. All that is necessary is a clean syringe and a large hypodermic needle. It is questionable, however, if, in the average case, injection of the same solution into the rectum be not as effective. The rectum rapidly absorbs hot salt water, and we avoid the risk of abscess in the cellular tissue, which we are liable to get if the instruments used and the solution and the surface of the skin be not aseptic, and in our hurry to meet the emergency there is ample loop-hole for error in technique. The hot (115° F.) saline (1 per cent.) solution is injected into the rectum, about 2 quarts being used, and this procedure is repeated to advantage hourly until the quality of the pulse improves. All of this solution is, of course, not absorbed, but sufficient is to stimulate the heart-action and to improve the quality of the blood.

A few words in this place in regard to splanchnic paralysis.

This frequently occurs, not alone after rapid, but also after slow and exhausting labors characterized by loss of much blood. It is characterized by sudden and intense collapse. Hæmorrhage may not continue, but there is decided anæmia, the abdomen becomes tympanitic from paralysis of the great nerve-trunks, in particular the great sympathetic. The woman bleeds into her venous system. The remainder of the blood is driven into the peripheral veins, and thus venous infusion becomes an easy matter, the reverse of what obtains in acute anæmia when the peripheral veins are empty. The prognosis is good and the treatment is that which is applied to shock. A hypodermatic injection of morphia, in full dosage, is given, and an intravenous infusion of normal salt solution. Glonoin in large dosage, $^1/_{20}$ grain hypodermatically, is indicated. It may be here repeated that much larger doses of this drug may be given than is customary for the reason that the symptoms resulting are evanescent, and a point to be noted is that the officinal solution should be used instead of the tablets, since the latter are not apt to remain stable. Further still, adrenalin, in a 1 to 1000 solution, may be administered hypodermatically in the dosage of 15 drops every three hours. This is a specific in case of paralysis of the intra-abdominal nerve-trunks.

The placenta and the membranes having been delivered, and the uterus remaining thoroughly contracted, the next step is to cleanse the woman's genitals and to apply the puerperal binder. If the delivery has been conducted after that aseptic fashion which should alone be tolerated to-day, there is no call for the administration of a vaginal or the intra-uterine douche. In case, however, there is any reason to question the strict asepsis of the different steps necessary for delivery, then it is wise to administer one douche, and this should be the last during the puerperium unless certain symptoms develop, stress upon which will be laid in the chapter dealing with the puerperal state. According to individual custom, this douche may consist of a 2-per-cent. solution of creolin or a 1 to 5000 solution of bichloride of mercury. It goes without saying that the syringe should be sterile, as well as the hands of the

PLATE XXVII.



The Puerperal Breast and Abdominal Binder and the Vulvar Pad

attendant who administers the douche. For both intra-uterine and vaginal douching immediately after the completion of labor, the ordinary glass tube attached to a bulb or a gravity syringe is the best. In case the douche is intra-uterine, the physician alone is competent to give it. Such a procedure should never be intrusted to the nurse.

The external genitals of the woman are carefully washed with a 1 to 2000 bichloride solution, and then the sterilized gauze pad is applied to the genitals, and this is pinned, back and front, to the abdominal binder.

Whilst the application of the abdominal binder can have no effect, as is the popular belief, on the restoration of the form of the woman, it nevertheless holds true that she is more comfortable if it be used. For a considerable time the abdomen has been subject to the strain of distension, and the sudden relief of this strain seems to call for some support. The binder is applied mainly for the above reason, except in those instances where there is reason to anticipate relaxation of the uterus, and then the binder serves the purpose of holding in position the pad which it is customary to place above the fundus of the uterus to guard against relaxation. (Plate XXVII.) The preferable binder is made of unbleached muslin, gored at the sides to fit over the hips. It is pinned firmly so as to give support, never to such a degree as to press the uterus out of its natural relations to the abdominal cavity.

The binder and the pad having been applied and the soiled draw-sheet having been removed, the woman lies in the clean bed and the puerperal state begins, the management of which is considered in a separate chapter.

## ABNORMAL LABOR.

Thus far we have traced the course of normal labor. Abnormal labor may depend on deviation from the course of the customary phenomena, either through abnormity in the mechanism or in the position of the presentation. We would lay renewed stress on the fact that any variety of presentation may terminate normally, provided the necessary mechanism be followed. Thus, even as we may have deviations from the normal in case of presentation of the cephalic or pelvic pole of the fœtus, even so may the face and the shoulder presentations terminate normally, provided only that the mechanism requisite for delivery be followed. It serves no useful purpose, therefore, to describe the course of labor under the various presentations. If the requisite mechanism in each case be fully understood there is need for description only of the complications the result of such position of the presenting part as necessarily entails defect in the mechanism.

Under this definition we pass to the description of

### ABNORMAL VERTEX PRESENTATION.

It will be remembered that, in order that presentation of the vertex may start the normal mechanism from the pelvic brim under the best possible conditions, the head should present in a position of flexion, which becomes intensified as, under the uterine contractions, engagement and descent take place. Occasionally the vertex presents semiflexed, or, practically, the brow of the fœtus offers instead of the occiput. Under such circumstances, as the uterine contractions tend to cause engagement, one of two things happens: Either the brow becomes converted into a presentation of face or else flexion occurs and we obtain the more favorable presentation of the occiput. The cause of this semiflexed position at the superior strait will usually be found to be an obliquity of the uterus, the result of which is that contractions of the uterus do not act on the short arm of the lever, but on the long arm, and consequently the head offers semiflexed instead of flexed. The rectification of such an anomaly, in case it be recognized before engagement, suggests itself. It consists simply in applying a bandage with an underlying pad over the side toward which the uterus inclines, with the result that the obliquity is rectified; or, the woman may be made to lie on the side opposed to the obliquity, when, under the force of gravity, the obliquity is rectified. In the event of the position being determined, as will ordinarily be the case, after engagement and before the rupture of the membranes, then, by means of suprapubic pressure on the occiput and applied pressure on the forehead by the finger in the vagina, there may result proper flexion of the head, which is what should be aimed at. Ordinarily, however, if the head enter the pelvic inlet in this semiflexed manner the result of the contractions will be to convert the position into one of the face, when, as we have seen, if anterior rotation of the chin take place delivery is perfectly possible through a normal pelvis, only the stages of labor—the dilating and the expulsory—are protracted. We will speak of this further under the subject of "Fate Presentations."

Under the subject of "Mechanism of Labor" stress was laid on the untoward nature of posterior positions of the vertex where anterior rotation failed. It was further stated that, in the majority of instances, anterior rotation probably occurred, even though delayed until the occiput reached the pelvic outlet. Still, we are never in a position to predict the case where this anterior rotation may not fail, posterior rotation into the hollow of the sacrum being substituted. In view of the untoward effect of such rotation on the woman and the child, it seems wise to advocate the conversion of the posterior occiput into the anterior as soon as it is detected, and so long as the conditions essential to success without damaging the woman or the child are present. By means of flexion and posture often change in position occurs, especially in instances where the smaller fontanelle is lower than the larger. However, in view of the untoward nature of result should this change not occur, after sufficient time has been given, it is the opinion of Grandin that the measures outlined should be resorted to. When recognized at the brim, before rupture of the membranes and before deep engagement, two courses are open to us,—the one is version and the other is the manual rectification. Where the pelvis is normal and the child is not too large for the pelvis, version does not seem to us called for. If the cervix is wide enough open to permit of version or if it be dilatable enough, then the insertion of the entire hand into the vagina and the grasping of the child at the neck and rotation of the fœtus, and, therefore, of the occiput into the anterior plane, as specially described in "Obstetric Surgery," suggests itself as preferable. This entails anæsthesia, but so also does version. The advantage gained, provided the fœtus can be made to occupy the position into which it is altered, is that the chances of the delivery of a living child are greater than when the fœtus is made to engage by the after-coming head, as is necessarily the case after version. Yet, since manual rectification, if successful, often is not maintained, and since anæsthesia, in any event is requisite, an elective version is the preferable teaching. Still, as a rule, if the mal-position be discovered early, the maintenance of flexion during the uterine contractions, will suffice. Where disproportion between the fœtus and the pelvis exists, on the other hand, it is preferable to elect version, since, in dystocia, due to this cause, the after-coming head molds better than the before-coming. Where the head has engaged by its greater segment before the posterior position of the occiput is determined, then, should the membranes have ruptured, both manual rectification and version are contra-indicated, and the duty of the attendant is simply to watch both the mother and the fœtus in the hope that anterior rotation may occur. Of course, the labor will be tedious, but interference will not be allowable unless either the woman or the fœtus shows signs of exhaustion. In such an event the best that the attendant can do is to apply the forceps and deliver, with the consequent necessary damage to the pelvic floor, unless, even during extraction by the forceps, anterior rotation should occur.

Rarely, in connection with presentation of the vertex, prolapse of a hand or of the cord occurs. Prolapse of the hand by the side of the head delays the labor, because it interferes with the requisite mechanism of labor. The treatment consists in the endeavor to push up the hand, and, this accomplished, if the membranes have not ruptured, then it is wise to break them, in order that, the vertex descending into the cervical ring, the hand cannot prolapse again. Rarely will it be necessary to resort to version to meet this abnormity. If the presenting part has engaged with the hand prolapsed, then it probably will not be possible to replace the hand, and the delay in the labor may be such as to threaten exhaustion, and then the forceps will be indicated to terminate the delivery.

Prolapse of the cord in case of vertex presentation is uncommon, compared with the occurrence in connection with presentations of the pelvic extremity. If it be determined before rupture of the membranes and engagement, then postural treatment will often answer for the correction of the prolapse, or, at any rate, the cord may be saved from pressure during the contractions until sufficient dilatation has occurred to enable us to either rupture the membranes and push up the cord before the head has a chance to engage or else to resort to version.

Very exceptionally we note what is termed an "inclined" presentation of the vertex. In such cases the ear or the parietal protuberance presents at the centre of the superior strait. Such presentations are the result of obliquity of the uterus. In case this presentation does not become rectified, then, since the long occipitomental diameter of the head offers at the superior strait, arrest of the head necessarily occurs and termination of the labor under the natural efforts is impossible. As soon, therefore, as this presentation is recognized, interference is called for at a time when assistance is comparatively easy, since, if the head become impacted, destruction of the fœtus through diminution in its bulk is the only method of delivery. When the head is still movable, if the membranes are unruptured, as soon as there is sufficient dilatation of the cervix, version is the operation of choice. In case the membranes have ruptured, the whole hand should be introduced into the vagina, the occiput is to be seized, and, during the absence of a contraction, the head is to be pushed up and flexion is to be secured. This, however, is not sufficient, but the head must be maintained flexed until the recurring uterine contractions have caused it to engage in the favorable position. If this manipulation is impossible, then, under deep surgical anæsthesia, whereby the uterus is relaxed as much as possible, the manipulation may succeed. This failing, the only resort, short of craniotomy, is a tentative application of the forceps. We lay stress on the word *tentative*, for, the forceps being applied above the pelvic brim and necessarily grasping the fœtal head so that the long occipito-mental diameter offers at the superior strait, it is questionable, unless the head be small in relation to the given pelvis, if traction will suffice to promote flexion and to cause engagement without the infliction of considerable traumatism on the maternal parts. The good rule, where version and restitution by the hand fail or are contra-indicated from the start, is to resort to craniotomy, unless, in full view of the increased risk, the woman or her representative elect symphysiotomy or the Cæsarean section. These operations will always be contra-indicated when the woman or the fœtus shows signs of exhaustion, since a major operation resorted to in the presence of exhaustion of either can but result in the delivery of a dead fœtus at the greatly-increased risk to the woman's life.

## FACE PRESENTATIONS.

Our study of the mechanism of labor has taught us that presentations of the face may terminate under the natural efforts, provided that rotation occurs with the chin to the pubes. It is a fact, however, that, under the most favorable conditions, face presentations prolong labor unduly, and that there is always imminent risk of maternal and fœtal exhaustion. Further, even though the face enters the superior strait with the chin pointing to the antero-lateral plane, in a given case we can never feel sure that, on reaching the pelvic floor, posterior rotation may not occur. The evident corollary is that a presentation of the face, when recognized before engagement, should always, where feasible, be treated either through conversion into a presentation of the vertex by a mechanism of flexion or else that version should be the operation of election. If, as some contend (Marx, among others), a face presentation may be considered normal, then such measures are to be condemned. This is a question which each individual must solve according to his individual experience. Grandin's experience would lead him to think that Marx is wrong in his interpretation. Where the membranes are unruptured, the cervix is dilated or dilatable, the woman being anæsthetized, the hand should be introduced into the vagina and, during the interval in a contraction, the occiput should be seized and the head flexed. This manipulation is not alone sufficient, but the head must be maintained flexed until, under the influence of the uterine contractions, the flexed head has engaged. Manipulation of this nature will rarely be successful without the membranes becoming ruptured, and then, if the manipulation should fail, one of the necessary conditions for version is absent. Unless, therefore, the pelvis be roomy or the child small, we favor the conversion of a face presentation into one of the pelvic extremity by version, when it is recognized at a time when this operation is not contra-indicated. That is to say, the membranes being ruptured, or, if they have just ruptured and the presenting part has not engaged, the cervix in each case being dilated or dilatable, version should be the operation of election.

Where the face has entered the cavity with the chin pointing to one or the other antero-lateral plane, then the duty of the attendant is to stay by his patient and to watch the mechanism carefully. In case there appears to be a tendency to posterior rotation he must interfere, in order to avoid the occurrence of a position which can alone be delivered with safety to the woman through craniotomy. The assistance which may be rendered by the physician consists simply in an attempt to favor anterior rotation of the chin. The most feasible way to do this is to apply the hand to the posterior cheek and to keep it there during contractions of the uterus, in order to prevent the rotation of the chin toward the sacrum. This manœuvre certainly favors anterior rotation, and often after a rapid fashion, thus avoiding a very tedious labor and consequent deleterious pressure on the maternal soft parts and injurious prolonged extension of the fœtal neck.

A partial presentation of the face is simply a presentation of the brow. Such a presentation, if not converted into one of the occiput or even of the face, cannot be delivered by the natural efforts, since the occipito-mental diameter of five inches offers at the superior strait. The indication for treatment, as soon as the presentation is recognized, is to insert the whole hand into the vagina, grasp the occiput, and flex the head. This flexion must be maintained until engagement, otherwise the brow presentation will recur. This manipulation applies, in particular, to instances where the brow presents, the occiput being in front. It is obvious that, in such a case, this is the only method, for, if we convert the impossible brow into a face, we have the equally impossible chin-to-the-sacrum position. Where the brow offers, with the occiput pointing posteriorly, then, if we flex the head, we convert the position into an occipito-posterior, which, we have seen, is an unfavorable position of the vertex. The aim of treatment, in such an event, is to extend the head and to convert the brow presentation into a face, with the chin anterior, or—and this we much prefer—to resort to podalic version if the necessary conditions for version are present,—that is to say, the membranes unruptured or just ruptured, the cervix dilated or dilatable. In case of a presentation of the brow, one or another of these manipulations are called for before the attendant should even think of the application of the forceps. It is simply a mechanical impossibility to deliver a presentation of the brow, before rectification, by the application of the forceps.

## PRESENTATIONS OF THE PELVIC EXTREMITY.

The characteristics of a presentation of the pelvic extremity are slow engagement, slow descent, slow rotation, and slow delivery. The pelvic extremity cannot assist in dilatation as can the rounded vertex, and, after engagement, the hips undergo rotation in a more protracted manner than the occiput. A corollary is that the membranes should be maintained intact as long as feasible in order to secure the advantage of the dilating hydrostatic wedge. The normal breech having engaged, the physician need only have patience in the vast majority of cases, simply watching the woman and the fœtal heart-beat in order to interfere if there occur sign of impending exhaustion. Where the pelvis and the fœtus are not disproportionate, and the complete breech presents, it will rarely be necessary to decompose the wedge,—that is to say, to extract the legs in order to favor the emergence of the nates,—the sole precaution here being to follow down the uterus closely as the breech emerges, otherwise the arms may become extended above the head and delivery become very complicated. Not alone must the arms be kept from extending, but the head of the fœtus must be maintained well flexed by suprapubic pressure, for, if extension of the chin take place, the delivery of the after-coming head is exceedingly complicated and usually at the expense of the fœtal life. Indeed, looking at presentations of the pelvic extremity from a broad standpoint, it is the management of the stage of the delivery which may offer difficulties and in which the fœtus is exposed to the greatest risk. Under usual conditions, if maternal exhaustion seem imminent, the labor may always be terminated through extraction even as would be the case had a primary cephalic extremity been converted into a presentation of the pelvic pole. The cardinal rule to bear in mind, therefore, is that, on the emergence of the breech, the uterus must be kept firmly applied to the fœtus, in order to avoid extension of the arms above the head, and that the head in turn must be maintained in a position of flexion except, of course, where the occiput has rotated posteriorly, when, under the necessary mechanism, extension is requisite, in order that the chin may engage under the pubic arch to enable the occiput to make its long sweep over the pelvic floor. The shoulders having been delivered spontaneously, or artificially by flexion and extension over the ventral surface of the fœtus, the sooner the after-coming head is extracted, the better. The child is apt to suffer greatly now through delay. Pressure on the umbilical cord cannot always be avoided and deep asphyxia always threatens. Downward traction on the shoulders, assisted by firm suprapubic pressure, will, in the vast proportion of cases, suffice to deliver the after-coming head, occiput to the pubes. We cannot lay sufficient stress on this downward traction. It is necessary that the suboccipital point should be engaged under the pubic arch before the mechanism of extension of the face over the posterior commissure can take place normally. Rarely, if this point be borne in mind, will it be necessary to resort to the application of forceps to the after-coming head. Further essential details in reference to the management of the after-coming head will be found in the portion of this work dealing with the surgery of obstetrics.

The management of presentations of the incomplete breech—that is to say, of presentation of the feet or foot or of the knee—does not differ from that of the normal pelvic extremity. The same essential points should be borne in mind. The membranes must be maintained intact as long as is possible, and, after delivery of the nates, the uterus must be closely followed down, in order to avoid extension of the chin in case of the normal anterior rotation taking place. There is one complication of these presentations which must be borne in mind as very likely to occur, and this is prolapse of the cord,—an accident which, if not remediable, certainly entails fœtal death. So long as the membranes remain unruptured the fœtus cannot suffer, since direct pressure on the cord is not possible. The attendant, therefore, need only wait and watch, directing the woman to lie, by preference, on the side opposed to that on which the cord tends to fall. This waiting policy is called for, since, until the cervix has dilated or is dilatable, interference of an active nature is unlikely to save the child, for delivery cannot be effected quickly enough with regard to the integrity of the maternal parts. By watching, the physician may take advantage of the period when rupture occurs in order to push up the cord and enable the presenting part to engage and to fill the upper pelvic strait so that there is no space for the cord to slip down. It is to be remembered, however, that prolapse of the cord is not unusual and needs consideration only when pressure-symptoms ensue.

Such conditions, however, are rather ideal ones. In the first place, prolapse of the cord will only exceptionally be recognized prior to rupture of the membranes. The physician, however, should always remember the possibility of this in incomplete pelvic presentations, and accordingly be prepared to act. If the prolapse occur and the cord cannot be replaced before engagement, then the course of action is to place the cord in that part of the pelvis which is least exposed to pressure, which varies, of course, according to the position of the presenting breech. During the further progress of the mechanism, should the pulsations of the cord become weak or cease altogether, it stands to reason that the sole hope for the child lies in delivery after as speedy a fashion as is consistent with the safety of the woman. The foot or the knee presenting, this is seized and extraction is accomplished according to the rules which govern version, the details of which are found in the portion of this work dealing with the surgery of obstetrics.

Other methods of reposition of the cord, such as the sewing of the gelatinous coating to a soft catheter and the carrying up of the catheter with the attached cord toward the fundus out of the reach of pressure, are not apt to be successful, aside from the fact that the extra manipulations entailed may infect the woman, no matter how careful our technique.

Presentation of the pelvic extremity, with the legs extended along the ventral surface of the fœtus, offers special difficulties, particularly in the final stage of expulsion. The same management of the stage of dilatation and of descent and rotation is indicated, but, when the presenting part has undergone this mechanism, unless the fœtus be relatively small in comparison with the capacity of the pelvic outlet, it will be necessary to decompose the wedge; that is to say, to bring down one or both feet before delivery can be effected. It is at once apparent how difficult this is where the pelvic extremity is wedged in the pelvis and the walls of the uterus are closely applied to the body of the fœtus. In order to reach the feet or even the knee it is necessary to secure uterine relaxation so that the hand may reach the fundus of the uterus in order to grasp a foot or the knee. Even if this can be accomplished, the task of flexing the leg on the thigh and then of bringing the leg down into the vagina is difficult. Surgical anæsthesia will be necessary in order to secure the requisite relaxation of the uterus, and, if the manipulation is successful, delivery should be terminated whilst the woman is anæsthetized.

Where this manipulation fails, and it ordinarily will if the breech is deeply engaged, there are a number of manœuvres at our disposal.

Where the groin of the fœtus is accessible we may be able to pass a sterilized gum-elastic catheter around, thread the eye with a stout sterilized cord, and make downward traction in the axis of the pelvic outlet. This manipulation will, of necessity, be around the anterior groin, since the posterior will be inaccessible, and the anterior must descend first and become fixed under the pubic arch in order to allow the posterior to sweep over the posterior wall of the pelvis. The string, or so-called fillet, is always to be preferred to the blunt hook which is still described in works on obstetrics, since this hook is very apt to injure the fœtus and, if it should slip, will damage seriously the maternal parts. If the groin is accessible and the fœtus and the pelvis are normally proportionate, then, frequently, the breech may be brought down by inserting the finger of one or the other hand into the groin, and, grasping the wrist of this hand by the other, downward traction in the axis of the pelvic outlet may suffice to bring the breech down. Should these manipulations fail, then the only resource is the forceps to the breech, applied as is indicated in "Obstetric Surgery."

During traction incidental to all these manipulations it is necessary that the uterus should be followed down well, otherwise the arms will extend over the head or the chin will extend, thus complicating the delivery of the after-coming head.

Of course, if extension of the legs along the ventral surface of the fœtus is diagnosticated before engagement, the proper course to pursue is to insert the hand and to bring down a foot whilst the manipulation is comparatively easy. This subjects the fœtus to risk, however, since then the cord may prolapse, but it is a question simply of choice between two evils, and the lesser consists in the manipulation just described.

In case of presentation of the pelvic extremity, when the trunk of the fœtus has been delivered, if the arms have been allowed to extend above the head, these must be delivered before the head can be extracted. The difficulties are great, and the life of the fœtus is very much compromised. It is necessary to insert the hand practically to the fundus and, by a mechanism of flexion, bring down first one arm and then the other. The umbilical cord, if not already subject to pressure, will certainly be during these manipulations, and there is, further, considerable risk of the uterine rupture should the lower uterine segment be thinned out. Where the fœtal pulse-beat in the cord has ceased it is useless to subject the woman to the accompanying risks of extraction of the fœtus, but perforation of the after-coming head had better be immediately resorted to. Occasionally, after delivery of the trunk, the lower uterine segment closes down on the neck of the fœtus, and then delivery of a living child is impracticable, unless the attendant instantly incises the cervix in order to release the neck. This procedure is one of great risk to the woman. It is difficult to make the requisite incisions, since the trunk of the fœtus is in the way of the necessary manipulations; and, again, owing to the fact that the muscular fibres are closely applied to the fœtal neck, it is a difficult matter to insert the scissors. The incisions, further, cannot be limited as we would desire. In case they extend into the lower uterine segment they may involve the broad ligament and give rise to extensive hæmorrhage into the subperitoneal tissue. In view of these facts, in case, under deep surgical anæsthesia, the spasm does not yield, it is wise to elect perforation of the after-coming head.

As was noted to be the case in presentations of the vertex, we may meet with what are termed deviated presentations of the breech. In such cases the sacrum or the hip offers at the superior strait, when, unless the position be rectified manually, the fœtus cannot engage and descend. As a rule, the necessary rectification will entail the insertion of the hand and the bringing down of a foot, when labor is completed, as is the case in a primary presentation of the foot.

## PRESENTATIONS OF THE TRUNK.

We have seen that, through spontaneous evolution, a transverse presentation may be delivered under the natural mechanism. Such an event, however, should never be anticipated. As soon as recognized, a transverse presentation should be converted into a presentation of the pelvic or of the cephalic pole. Before labor external version will accomplish this, although the vicious presentation is very likely to recur. If the transformation into a vertex presentation is accomplished before the onset of labor, a firm bandage should be applied with pads at opposed sides of the abdomen above and below, the object being to prevent the breech from descending and the vertex from rising. Notwithstanding these precautionary measures, the transverse presentation may recur, and then, in addition to the pads, it may be necessary to keep the woman in bed, lying as much as possible on the side opposed to the breech.

If the presentation of the trunk be not recognized until labor has set in, then precautions should be taken to keep the membranes intact until the cervix is dilated or is dilatable, when, under anæsthesia, podalic version should be resorted to. Where the presentation is not recognized until after rupture of the membranes, then, if the shoulder has not engaged deeply, it may still be possible, under the relaxation secured through the administration of ether, to push up the shoulder and to bring down the foot; but, if the uterus is firmly contracted around the body of the fœtus and the engagement is deep, then, instead of endeavoring to perform a forced version with the accompanying risk of rupture of the uterus, decapitation should be elected, unless the woman, in full view of the greater risk to herself, should elect the Cæsarean section. This major operation will be always contra-indicated, however, if the mother's condition be not good or if there is evidence of exhaustion of the fœtus.

In the rare instances where spontaneous evolution occurs the duty of the physician is purely passive, watching the woman for evidences of exhaustion. Exceptionally, even after impaction of the shoulder, it may be possible to cause spontaneous version to occur.

This will only be the case, however, where the fœtus is small in comparison with the pelvis, or the reverse. Then, by replacing the prolapsed arm and by pressing on the shoulder, *sometimes* the one or the other pole of the fœtus will present instead, and the labor is terminated by nature or by art, according to the condition of the maternal vital forces.

### MUTIPLE PREGNANCIES.

Although a woman may deliver herself of two or more fœtuses without the intervention of the physician, still, since the course of labor is apt to be complicated at one or another stage, it seems wise to discuss the subject of multiple pregnancy in this chapter.

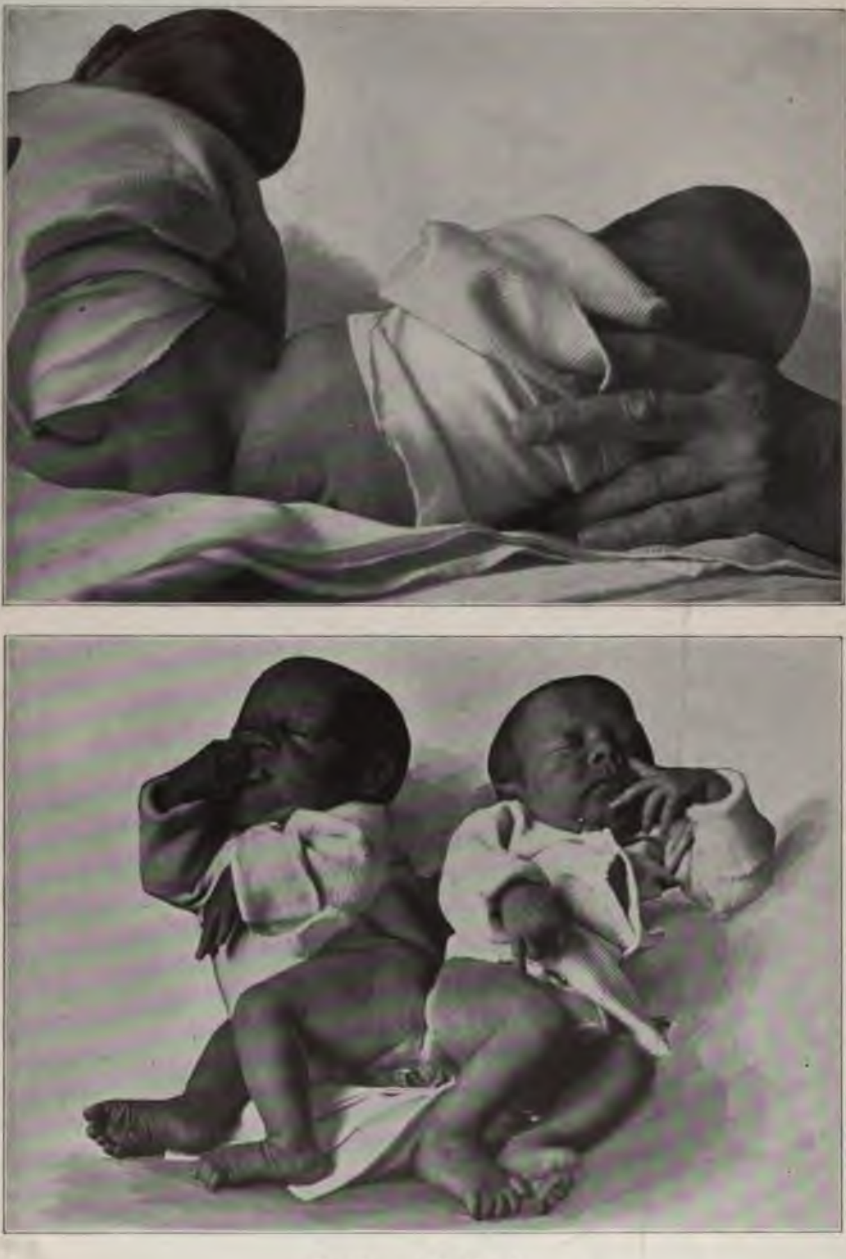
Three reasons are offered for the occurrence of multiple pregnancy: either two Graafian follicles are fecundated at the same time and develop concomitantly, with the result that two fœtuses are delivered; or a single follicle contains two ova which are fecundated at the same time; or a single follicle contains two nuclei.

An outcome of these possibilities is the fact that two ova shed at the same time may be fecundated at different periods by the same or by different persons, giving rise to what is termed superfecundation; or, again, two ova shed at different times are fecundated at intervals more or less prolonged; or, again, a spermatozoön may have two heads and both may be capable of fecundating separate ovums. Marx is authority for this statement, having seen such a spermatozoön when a student in Vienna, under Ultzman. This latter occurrence is termed superfætation. Superfecundation has been proved possible by the delivery of women at term of fœtuses of different color, the result of the women having sexual commerce with a white man and a negro at periods not far removed. Superfœtation, on the other hand, is not so easy of explanation. This occurrence necessitates that after the first fœtus has attained a certain degree of development a second ovum becomes fecundated as much as possible, the manipulation may succeed. This failing, the only resort, short of craniotomy, is a tentative application of the forceps. We lay stress on the word *tentative*, for, the forceps being applied above the pelvic brim and necessarily grasping the fœtal head so that the long occipito-mental diameter offers at the superior strait, it is questionable, unless the head be small in relation to the given pelvis, if traction will suffice to promote flexion and to cause engagement without the infliction of considerable traumatism on the maternal parts. The good rule, where version and restitution by the hand fail or are contra-indicated from the start, is to resort to craniotomy, unless, in full view of the increased risk, the woman or her representative elect symphysiotomy or the Cæsarean section. These operations will always be contra-indicated when the woman or the fœtus shows signs of exhaustion, since a major operation resorted to in the presence of exhaustion of either can but result in the delivery of a dead fœtus at the greatly-increased risk to the woman's life.

### FACE PRESENTATIONS.

Our study of the mechanism of labor has taught us that presentations of the face may terminate under the natural efforts, provided that rotation occurs with the chin to the pubes. It is a fact, however, that, under the most favorable conditions, face presentations prolong labor unduly, and that there is always imminent risk of maternal and fœtal exhaustion. Further, even though the face enters the superior strait with the chin pointing to the antero-lateral plane, in a given case we can never feel sure that, on reaching the pelvic floor, posterior rotation may not occur. The evident corollary is that a presentation of the face, when recognized before engagement, should always, where feasible, be treated either through conversion into a presentation of the vertex by a mechanism of flexion or else that version should be the operation of election. If, as some contend (Marx, among others), a face presentation may be considered normal, then such measures are to be condemned. This is a question which each individual must solve according to

*PLATE XXVIII.*



*Pygopagus* (*Tynberg*).

single fœtus, but not uncommonly one fœtus seems to be developed at the expense of the other, leading to the suggestion of immaturity. At times, one fœtus dies during gestation, either from lack of proper blood-supply, or, what really amounts to the same thing, through compression exercised by one fœtus on the other. Where the fœtuses occupy a common sac the cord of one may become entangled around the neck of the other, the result being that through tightening of the cord this fœtus is killed. At times, in twin pregnancy, one fœtus is born perfect in development whilst the other is imperfect, possibly to such a degree as to constitute a monstrosity. Again, where the fœtuses occupy a single sac fusion may occur at one or another part, giving rise to a species of monstrosity known as joined twins. The junction may be at the head, or sternum, or back, or at the pelvis, an interesting example of the latter which we have seen being figured in Plate XXVIII. Again, one fœtus may be included in the other,—so-called cases of fœtal inclusion. Details in reference to these cases of monstrosity will be found in works devoted to the subject.

The diagnosis of multiple pregnancy is by no means a simple matter; indeed, in the average case only a presumptive diagnosis may be reached. The excessive size of the abdomen, where this is a factor, may be present in cases where there is simply an excess of liquor amnii. In case hydramnion complicates twin gestation, the diagnosis is concomitantly more difficult, owing to the greater difficulty of making abdominal palpation. Where, on auscultation, two fœtal hearts are heard beating with separate rhythm and with maximum intensity at different parts of the abdomen, particularly when such data are established by separate observers, then there is a reasonably strong presumption of multiple gestation. If, in addition, on palpation two heads are felt or two pelvic extremities, then this presumption is strengthened.

As a rule, in cases of twin gestation, the tension of the abdominal walls is greater, owing to the greater distension of the uterus. This, however, is purely a relative phenomenon, since the same condition accompanies cases of hydramnion. Late in pregnancy we are apt to find suprapubic œdema and also a transverse depression just above the pubes. The same signs, however, may, again, accompany instances of excessive amount of liquor amnii. Where, on vaginal examination, the head is found presenting and yet at the upper uterine segment a head is felt, or if a second head is determined in one or the other lateral uterine walls, then the diagnosis of twin gestation is certified. As a rule, however, the only positive sign of value is the hearing of more than one fœtal heart differing in rhythm and in location of maximum intensity.

Labor in case of multiple gestation is apt to be prolonged, since the woman has to undergo the process twice, as it were. The third stage is apt to be complicated by hæmorrhage, since, owing to the excessive uterine distension, uterine atony is a common sequence. The labor itself will rarely offer difficulties unless one fœtus interferes with the execution, by the other, of the requisite mechanism. The fœtuses may present in any possible way. Thus, they may both offer by the heads or the pelvic extremities, or one may present by the breech and the other by the head, or one may offer by the head or the pelvic extremity and the other be transverse. Where the fœtuses occupy separate sacs interference is less likely than when they lie in a single sac. After one fœtus has been delivered there occurs a pause and then the uterine contractions start in again, the second amniotic sac ruptures and the second fœtus is born. It must never be forgotten that even though there exist two placentæ the anastomosis between the two may be partial or complete, and that, therefore, if on the delivery of one fœtus the cord be not tied toward the maternal as well as toward the fœtal surface hæmorrhage will kill the second fœtus. Where after the delivery of one fœtus there is sign of impending maternal exhaustion we should not await the onset of the second labor, but, dilatation having been effected, the twin should be delivered by forceps or by version, according to the degree of engagement, and after the manner laid down in the portion of this work dealing with the surgery of obstetrics. We should always bear in mind the danger of uterine atony and consequent hæmorrhage and be prepared to tampon the uterine cavity in case the milder means for causing uterine contraction do not speedily suffice.

Where the fœtuses occupy a common sac one twin may descend by the head or the breech and occupy the pelvic inlet with the first fœtus. This is alone possible, of course, where the pelvic inlet is excessively large compared with the bulk of the fœtuses, or the reverse. In such an event we have an impaction, and, in order to effect delivery, it may be necessary to sacrifice one or the other fœtus in order to give the other an opportunity to be born alive. Where the head of the second fœtus engages in advance of that of the first we have a complication known as locked twins, and here, in order to deliver at all, it becomes necessary to decapitate one before the other can be delivered.

Transverse presentations are not uncommonly met with in case of multiple gestation, a point to be remembered, because, on the birth of the first fœtus, if the other occupy the transverse diameter immediate delivery by version is called for before we obtain an impacted shoulder. The occurrence of spontaneous version or evolution should never be awaited.

The statements we have made in reference to twin gestation apply with equal force to instances of triplets, or quadruplets, etc. Triplets occur about once in eight thousand deliveries; quadruplets and quintuplets are of excessive rarity, although a number of authentic cases have been recorded. Obviously, the difficulties which delivery may offer are intensified by the number of fœtuses present. If the physician will only bear in mind the fact that it may become necessary to interfere in the interest of the fœtuses or of the woman, and that the danger of hæmorrhage from atony of the uterus is greater than in case of single gestation, he will be ready to meet the exigencies of the individual case as they offer.

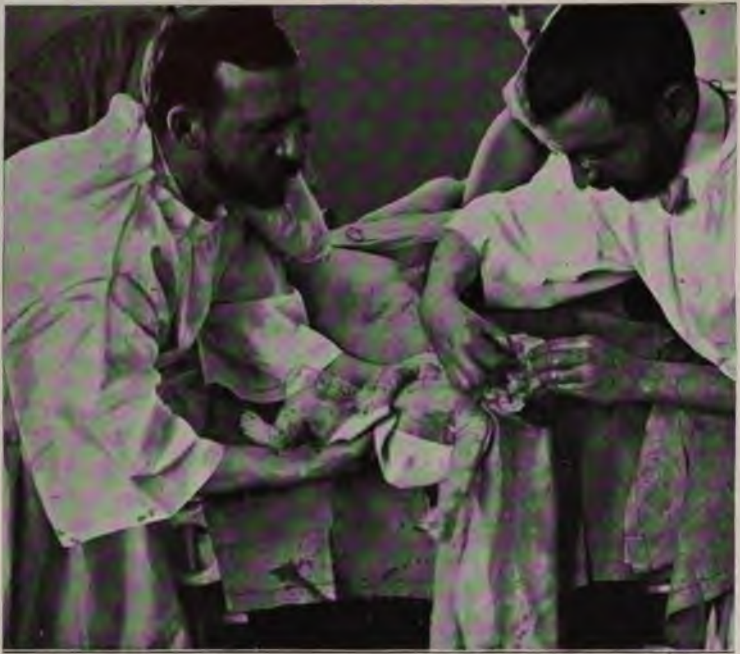
### INVERSION OF THE UTERUS.

An occurrence which renders labor abnormal, and which remains to be referred to, is inversion of the uterus, and this constitutes a most serious complication. The causes, in general, are atony of the organ associated with irregular contraction at the fundus, or a possible cause is attempt to deliver the placenta by traction on the cord. This factor will hardly be efficient unless there is associated atony, with the tendency to contraction of the upper uterine segment. As a rule, traction on the cord if the placenta does not appear will result in rupture of the cord.

Inversion of the uterus may be partial or complete. One or another horn may appear or the entire organ may turn inside out and emerge at the vulva. The uterus being atonic, the blood is pouring out of the uterine sinuses and the condition of the woman may become most critical. Reposition may be most easy and again most difficult. Where difficulty arises it is due to the fact that the inverted lower uterine segment, which now lies above, contracts down and offers a barrier to reposition. If the inversion can be promptly rectified by pushing up one horn and then the other, and finally the centre of the uterus, it must be remembered that the tendency to recurrence is very great, and, therefore, the physician should remain by his patient until, through the administration of ergot and of strychnia, he is satisfied that the organ has regained tone and will remain contracted. In case spasm of the lower uterine segment occurs, preventing reposition, then, under ether anæsthesia, the spasm may yield and reposition be possible. If this fail we would advise a waiting policy unless the woman is losing much blood, since the spasm may yield after an interval. In case the hæmorrhage is free the attempt may be made to check it by the firm tamponade with sterile gauze held in place by a bandage, bringing to bear compression, as it were, although under the given conditions this will prove very difficult. Should this attempt fail, before the woman becomes exsanguinated the sole resource—desperate as it is—is to open the abdomen and stretch the contraction ring. It has become a choice between two evils,—allowing the woman to bleed to death and subjecting her to the risk of sloughing of the imprisoned portion of the uterus, or resorting to the major operation for the release of the spasm. The manipulation which this complication requires must be characterized by the most absolute asepsis, else the woman will be infected.

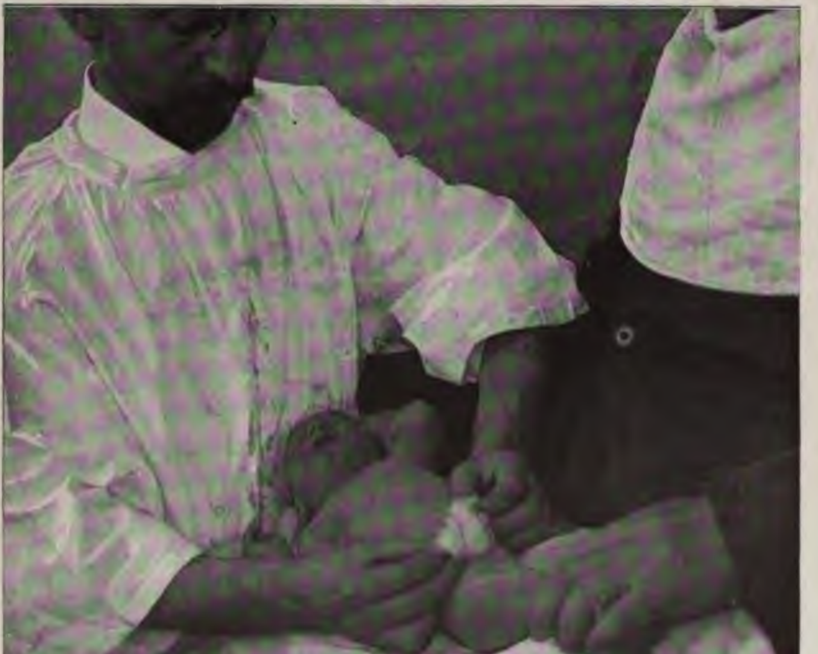
*PLATE XXIX.*

A



*Washing the Eyes of the Fœtus Immediately After Delivery.*

B



*The Dressing of the Umbilical Cord.*

# CHAPTER VIII.

## CARE OF THE NEWBORN INFANT.

The fœtus having been separated from its mother through ligation of the umbilical cord, the first care requisite is attention to the eyes. Even before the cord is tied, where the exigencies of the individual case do not call for immediate ligation, the eyes should be washed. The average fœtus comes into the world with its eyes coated with the vernix caseosa, and, although in a case where the woman is free from infectious taint this cannot affect the eyes injuriously, seeing that in no given case are we in a position to certify that our technique has been absolutely aseptic, care in the early cleansing of the eyes is called for. (Plate XXIX, A,) The vast proportion of cases of ophthalmia may be traced to infection whilst the child is emerging from the genital canal, or even whilst it is in the canal, since, once the membranes ruptured, the eyes may readily come in contact with infectious material. The method of caring for the eyes will vary according as we are satisfied or not that the woman is free from specific taint. If she give no history of precedent vaginal discharge or if she is in that walk of life where gonorrhœal virus is not so apt to exist,—although such inference is never safe, since, whilst we may feel quite sure of the woman we can never have the same degree of confidence in the purity of the male,—then the following procedure is ample. With aseptic hands the physician or the nurse wipes off the eyelids with a piece of sterile gauze or cotton soaked in a saturated solution of boric acid, and, this accomplished, the eyelids are opened by the thumb and index of one hand, whilst the conjunctival surface is carefully cleansed by irrigation with the same solution. If the palpebral surface of the lids is covered with the vernix caseosa, then the physician should evert the lids and wash this surface off. We lay stress on the careful asepsis which should be associated with this manipulation, because eyes otherwise not infected may become so if our technique is at fault, and this may mean irreparable damage. The same care should be associated with the washing of the eyes thereafter, although, unless symptoms develop, it is not necessary afterward to do more than wash carefully the external surface of the eyelids. Since these principles have been introduced into obstetrics it has become exceptional to meet with cases of even mild ophthalmia.

In the event of there being a suspicion of gonorrhœal infection, it is not sufficient to use boric acid. Opposed, as we are, to the routine adoption of Credé's method of instillation of silver-nitrate solution, we are firmly convinced that its adoption in every suspicious case has been the cause of the infrequent occurrence of aggravated ophthalmia with its awful sequelæ. We look upon it as little short of barbarous to instill the silver solution unnecessarily into the eyes, whilst we realize to the full the great value of the method in aborting a possible virulent ophthalmia or in modifying its course.

Where there is a suspicion of possible infection, the eyes are first carefully washed with boric-acid solution, and then the eyelids are everted by the physician,—for the nurse, unless specifically trained, is not competent,—and 2 drops of a 2-per-cent. solution of nitrate of silver is instilled, care being taken that the solution comes in contact with the conjunctival surface of the eyelids as well as of the eyeball. Too much stress cannot be laid on this point. The newer derivatives of silver may be used, protargol and argyrol, in 10- to 20-per-cent. dilution. It is an open question, however, if they are more effective than the nitrate of silver, and it is also questionable if the latter, in a 1-per-cent. solution be not as efficient as the 2-per-cent. If this precaution be neglected, then our technique is imperfect and ophthalmia may develop. The *rationale* of the method depends on the determined ability of silver nitrate of killing the infectious elements,—the gonococci of Neisser. After a minute or two the excess of nitrate of silver is washed off and neutralized by instilling a solution of sterile 2-per-cent. salt. As a result of this instillation of the nitrate of silver a traumatic inflammation is induced, which leads to congestion of the conjunctiva and more or less swelling of the eyelids, but these symptoms should abate in the course of twenty-four hours, and it is unnecessary to repeat the process. Where the eyes have not been carefully washed or where they become infected notwithstanding the care taken, then we have to face an ophthalmia which will run a mild or a severe course, according to the degree of infection and also according to the measures resorted to for treatment. In case of the development of an ophthalmia, the severest oversight is necessary to avoid the complications,—ulceration, perforation, and permanent blindness.

If, in the course of twenty-four to thirty-six hours after delivery, the eyes, or one alone, begin to secrete a muco-purulent matter, then the instillation of nitrate of silver should be repeated, and, as soon as there appears chemosis or swelling, ice-pads should be kept over the eyes constantly. A convenient method of doing this is to place a number of thin pledgets of absorbent cotton on a block of ice and to instruct the nurse to apply them over the eyes frequently. In case only one eye is affected, great care is requisite to avoid infection of the other. This may be accomplished by placing a watch crystal over the sound eye or, preferably, a gutta-percha shield. It is advisable to insist that the nurse wear rubber gloves, since nurse-"intellect" is a very uncertain factor and she may not appreciate as much as she should the stringent necessity of not carrying infection. The nurse should never touch the other eye without first carefully sterilizing her hands, and all cloths or cotton used for the infected eye should at once be destroyed, to avoid the possibility of their being used for the non-infected eye. When the physician lives in a city where he can obtain the services of an ophthalmologist, it will be wise to turn the infant over to his care. In remote country-districts, however, this will not be possible, and the points to be borne in mind are those on which we have laid stress, and, further, that, as soon as the swelling of the eyes begins to disappear, the time has come to discontinue the use of the ice. It is not possible to lay down definite rules for the frequency with which silver nitrate should be instilled, since there is difference of opinion among the expert. Our impression is that, after thirty-six hours, repetition of the silver solution is uncalled for, except where microscopical examination of the secretions shows that the gonococci are still present. As long as they exist the silver solution is indicated, and no longer. As soon as it is possible to dispense with the silver solution, either a saturated solution of boric acid should be used or else a sterilized 2-per-cent. solution of common salt.

During the few days following the birth of the child the most rigid precautions as to cleanliness of the eyes should be enforced, since, at this time, they are unable to resist infection as they are, to a better degree, later, and on these precautions the sight of the infant depends.

The eyes having been attended to, the next step is to bathe the child. From the start the infant should be accustomed to its altered surroundings, and the greatest of all mistakes is to coddle it. As it is started so it is apt to progress through life. It can best resist the effect of changes in temperature if it become accustomed to such changes. The infant who is looked upon even as a fragile china doll would be, will not grow up with the sturdy constitution and the resisting power which is so essential to healthy manhood and womanhood. The bath of the infant, therefore, should approximate in temperature that of its external surroundings. What should be aimed at is the avoidance of chill. The temperature of the bath, therefore, should be only slightly in excess of that of the room in which it is bathed. As a rule, a temperature of 80° to 90° F. should be selected, except in the case of immature infants, when, since we are not dealing with an individual of normal capacity, we must make the circumstances meet the case. The first step is to remove the coating of vernix caseosa and of blood with which the infant is covered to a greater or less degree. This is accomplished by greasing its surface with some unctuous material, such as sweet-oil or vaselin, the precaution being taken not to allow any of the material to get into the eyes or the stump of the cord, since it is not sterile. This greasing accomplished, the infant is supported on the hands of the nurse and placed in the bath so that the entire surface is covered with the exception of the head. It is then soaped and washed until the surface of the body has been cleansed, when it is removed from the bath and thoroughly dried. The flexures of the body are then covered with vaselin or a pure rice- or bismuth-powder, to avoid chafing of the delicate integument, and next the body is examined for defects. The natural openings are investigated in turn and the toes and the fingers are counted, since one of the first questions of the anxious relatives will be as to whether the child is perfect or not. If any imperfections are determined it is wise not to tell the mother, since the nervous anxiety she would be subject to would complicate her convalescence; but the father or some relative should be told, and, in case of such a complication as imperforate anus or urethra, steps requisite for giving speedy surgical aid should be taken.

The cord should now be dressed. (Plate XXIX, B.) This matter is usually left to the nurse, but it falls within the province of the physician, since infection at the site of the umbilicus is a frequent cause of sepsis of the newborn. We are dealing with a wounded surface and the attention requisite is similar to that which any wounded surface demands; that is to say, asepsis is a *sine quâ non.* A pledget of sterile absorbent cotton or of gauze is wound around the cord, and this is left in place until the cord drops, varying from the seventh to the tenth day. During this interval the child should not receive a full bath, since our aim is to have the cord undergo dry gangrene after an aseptic fashion, and this is interfered with if the dressed cord is wetted, aside from the danger of infection with each manipulation.

If the cord has been properly tied there is little danger of secondary hæmorrhage except in case of hæmophilia; still it is a wise precaution for the physician to investigate the dressing at his first visit after delivery, in order to satisfy himself that there has been no bleeding. In the event of hæmorrhage if the first ligature has been applied as it should be, at a sufficient distance from the body of the child to admit of the application of a second ligature, it may prove an easy matter to arrest the hæmorrhage; otherwise, without trusting to the possible action of astringents, transfixion of the base of the umbilicus should be resorted to. In this connection we would note that a most valuable hæmostatic for oozing from the cord is offered by antipyrin applied in powdered form. Possibly any of the coal-tar derivatives will answer as well. Powdered adrenal or the 1 to 1000 solution is, after all, our mainstay, and, in case the child is born of a hæmophiliac woman, this should be used as a routine measure.

After the cord has separated it should still be treated as a wounded surface would be; that is to say, according to aseptic principles. It should be kept dusted with bismuth-powder and a firm pad applied over it until cicatrization has become firm, in order to avoid the possibility of umbilical hernia.

The child should now be dressed. All that we, as physicians, can do is to suggest forcibly the desirability of the infant not being clothed too warmly. Excessive weight should be avoided, and yet the infant should be sufficiently clothed to avoid chill. The nurse should be instructed never to cover the head of the infant, all that is really needed being to see that it does not lie in a current of air.

After the woman has rested for an interval after delivery, it is advisable to apply the child to the breasts for the triple purpose of accustoming the nipples to lactation; of giving the child the colostrum in the breast, which is nature's castor-oil, so to speak; and, finally, for the purpose of obtaining the reflex effect of irritation of the mammary glands on the uterus, which conserves the desired firm contractions of that organ.

Before applying the child to the breast, and this rule holds for every nursing, the mouth should be washed out with a saturated boric-acid solution, and the nipples should be similarly treated before and after nursing. These precautions are essential in order to avoid infection of the nipple, which is the cause of abscess of the mammary gland.

During the first few days of the infant's life it requires, besides the colostrum which it obtains from the mother's breast, only an abundant supply of water. This infant has come from the uterus, where it knew nothing about catnip-tea and sugar and milk and water; it enters the world with its intestinal canal filled with the liquor amnii and possibly meconium, and before its stomach is ready to assimilate food these waste products must be eliminated. The colostrum does this, and on or about the third day, when, as a rule, the milk appears in the breasts, the infant is prepared to receive it and to assimilate it. At intervals of about four to five hours prior to the advent of the milk the child should be applied to the breasts, the nipples thus becoming accustomed to traction and the child to receiving its supply of colostrum. On the appearance of the milk the average infant should be put to the breasts at intervals of two to two and one-half hours, and this routine should be the rule up to the third month, when the intervals between the nursings should be lengthened to three hours. It is impossible to rear every baby according to a fixed routine, since the gastric capacity and the functional activity of one necessarily differs from that of another. It has been proven that the rules we have laid down as to frequency of nursing are applicable to the average infant, and, according as they are followed or not, so will the child start in life with good or bad digestive tract. Overfeeding is as bad as underfeeding. Each child must be judged by itself, and it will require a week or two to find out just what the individual infant needs and can digest. During the intervals between the nursings the child should be given boiled, cooled water to drink, and then, if it be healthy and not chafed and the mother affords it a sufficiency of milk, both in quantity and quality, the early days of the infant are spent in sleeping and in feeding.

An infant can be trained from the start even as can a puppy. If it be accustomed to being rocked and walked the floor with and overfed, so must the parents continue or else have a struggle for the mastery. If from the start regularity of habit be followed, then the nursing mother will secure needed rest at night and the healthy infant will remain so. For the first few months of its existence it will be nursed about seven to nine times in the twenty-four hours, at intervals of two to two and one-half hours during the day and at from four- to five- hour intervals during the night. The child should be weighed every ten days to a fortnight, and so long as it is gaining in weight it is thriving, even though it occasionally suffers from colic or has, at times, stools of a green or slimy character. Frequent feeding or, rather, overfeeding will be found to be at the bottom of green stools or colic, where the maternal milk is of proper quality, and the administration of a teaspoonful of lime-water, for a few doses, before the application of the child to the breast will correct the hyperacidity of the stools and the fermentation, or else an enema of soap-suds and warm water will do so by clearing the undigested milk from the intestinal canal. These milder measures should always be tested before resort to the administration of drugs. The more common sense is utilized in the rearing of the infant, the less will it be requisite to resort to drugs.

Regularity in nursing, sleep, bathing, and a sufficiency of fresh air and water are the keystones which lead to the development of the healthy child.

Thus far we have traced the care which should be given to the infant born at term and in sound condition.

Premature infants demand special attention. The child born at the thirty-fourth to the thirty-sixth week does not as readily accommodate itself to its surroundings. Its organs are not developed to the requisite degree, and we must lend it artificial aid. Thus, it must be clothed more warmly, and this is accomplished by wrapping it in cotton and surrounding it with hot-water bottles, or, in case of prematurity to the extent of six weeks before term, it should be placed in an incubator such as is described in the surgical portion of this work. If such an apparatus be not obtainable one may readily be improvised. Often the premature infant has not the power to exert sufficient suction to empty its mother's breast, and if we do not come to its aid it drifts rapidly into a condition of inanition. Obviously, as the maternal milk is the best food for the infant at term, it becomes all the more so where the child is immature. The woman's breasts should, therefore, be milked out by hand and the child fed with it by means of an ordinary medicine-dropper. Absolute cleanliness should characterize this process, in order that the milk should reach the infant in as sterile a condition as it exudes from the breasts. The immature infant, further, requires feeding at more frequent intervals than does the mature, since, its gastric capacity and function being less, it cannot obtain the requisite amount of nourishment in the same interval of time as can the mature child. Possibly we can supplement the food of such an infant by having its body anointed a number of times a day with sweet- or codliver-oil.

### THE ARTIFICIAL FEEDING OF INFANTS.

Of late years the tendency would appear to be among pediatricists to eliminate woman as a nursing animal. So far, indeed, has this false teaching extended that, among the better classes, women take pride in not being able to nurse their young instead of considering such ability the highest of the qualifications of motherhood. In our opinion that woman who can and refuses to nurse her child is unfit to have one. Social duties and physical inconveniences should never be allowed to make woman forget that there is no substitute for breast milk, and that neither physiological chemistry nor organic has enabled man by modification or by sterilization or by Pasteurization to improve on the food which the Architect of the Universe has placed in woman's breast. In the following résumé we have drawn largely on the writings of that Nestor among pediatricists, Abraham Jacobi, whose teachings are widespread throughout the world.

Whenever woman is unable to nurse, there is but one substitute and this is cows' milk. The various foods placed upon the market by well-meaning but financial chemists are to be disregarded. The mixed milk of a dairy is to be preferred to that of one cow, and this milk should be boiled before administration. It goes without saying that scrupulous cleanliness should be the associate of any and every preparation of the food. Cows' milk differs from woman's in the quality of the casein, the former being far less digestible. Infant's food, in order to approximate woman's milk, should not contain more than 1 per cent. of casein. The addition of cereals is the best way of diluting the cows' milk. Those of utility are barley and oatmeal, the former to be added where there is tendency to diarrhœa, and the latter where the infant is constipated. The milk, as we have stated, should be boiled in order to destroy germs. The cereal indicated is added in the proportion of two parts to one of milk in the early days of the nursling, the proportion of milk being increased as the infant approaches the third month. The sugar to be added to the mixture should be *cane* sugar and not *grape* sugar. Jacobi's statements in regard to this point are absolutely conclusive. Lime water should be added in sufficient amount to make the mixture slightly alkaline. The average infant will thrive upon milk prepared after this fashion, provided the rule be remembered that the child should neither be overfed nor underfed. Each child is a law unto itself, and no fixed standard can be established. A little experimentation will soon teach how much food the infant in question requires. Water in plenty should be given between the hours of feeding, and in feeble infants we have found Jacobi's suggestion of giving a teaspoonful of cane sugar to the child just before each bottle an admirable one.

A word as to wet-nursing. Unquestionably the milk of another woman is the ideal substitute, but in practice great difficulties exist. It has been truly said that the "model wet-nurse should be a woman of suitable age, who has lost her own child at about the same age as the foster-child. She should have a breast of good and abundant milk; be free from actual or hereditary predisposition to disease; possess a kindly disposition and a kindly temperament; have no vicious, lazy, gluttonous or unclean habits; be animated by a love of children rather than by the money value of her services." If such a woman could be found, unquestionably the best substitute for the mother would be the wet-nurse. But, unfortunately, the average woman to be secured is the very reverse. She enters the household and at once assumes that all should bow to her and be subservient to her wishes. She thinks that the parents will put up with all her whims and demands lest baby suffer. She either drinks or develops a taste for liquor. As a rule she is fonder of a lie than the truth, and if she does not neglect the baby she may drug it. Again, notwithstanding the most careful examination, hereditary or acquired disease, such as syphilis, may be the legacy she will leave the baby.

On the above and other grounds, it must resolve itself into resorting to the method of feeding we have just described.

The child should receive a bottle every two to two and one-half hours up to the age of three months, and then a bottle every three hours. It will soon become accustomed to sleep from five to six hours during the night.

Those who have the care of the infant must be impressed with the fact that bottles and all utensils must be kept scrupulously clean. Intestinal disturbance will inevitably result otherwise. The bottle must be scalded before filling with milk and the nipples must be inverted and scrubbed with a brush. When the nipples are not in use they should be kept in a solution of boric acid. The nurse should never be allowed to use other nipple except that which fits directly over the bottle. Any residual milk must be thrown away. No tube extending into the bottle should be allowed. As soon as possible the child should be trained to take its food from a spoon or a cup.

## ASPHYXIAS.

As far as the infant is concerned, the great emergency which offers is *asphyxia*. We distinguish two types,—the anæmic form of asphyxia and the congestive or apoplectic form.

The causes of asphyxia, in general, are dependent on conditions of the woman and on the placenta or the cord. The anæmic form results from insufficient nourishment dependent on disease of the placenta or in compression or twist in the cord. Thus, the anæmic type results from the fact that the infant either receives a deficient supply of oxygenated blood or else the condition of the woman is such that she is unable to give the infant the oxygen which it needs. Antepartum hæmorrhage, for instance, associated usually with placenta prævia, is one cause of the anæmic type of asphyxia, for the reason that the woman loses so much blood that what she furnishes the fœtus is of poor quality. Disease of the placenta interferes with the infant receiving the oxygen which it needs, seing that the circulation through this organ is impeded. Obviously, where the cord is twisted or compressed the fœtus suffers from lack of blood.

The apoplectic form of asphyxia, on the other hand, usually follows protracted labor or conditions which have resulted in spasm, to a greater or less degree, of the uterus during the second stage. In this form the fœtus receives a sufficient supply of blood, but it is again improperly oxygenated, becomes venous in quality, and there results congestion.

In the anæmic form the infant is born pale and limp, the surface being cold and the muscular system flaccid. The sphincters are relaxed; the heart-beats are faint and rapid or imperceptible. The pulsation in the cord is similarly faint or imperceptible. Respiration is absent altogether or gasping at long intervals. The picture is one of acute shock from loss of blood. In the apoplectic form, on the other hand, the surface is congested; the muscular system approaches rigidity; the pulsations of the heart are slow and labored; it may be possible to excite reflex movements in the fœtus; respiration is slow and labored.

Either of these types of asphyxia may be so profound as to simulate death, and yet, in every case, the methods of resuscitation should be faithfully tested, since there are many cases on record where, through perseverance, even a forlorn hope has resulted in a victory. Where the diagnosis of the form of asphyxia is made prior to the cutting of the cord, it is advisable not to tie in the anæmic form so long as it is possible for the woman to furnish the infant with blood; that is to say, tying should be delayed for a number of minutes. In the apoplectic form, on the other hand, it is wise to allow the cord to bleed, thus in a measure relieving local congestion. During these procedures the mouth and nose and pharyngeal vault should be cleared of mucus and liquor amnii by inserting the finger, covered by a piece of muslin, into the mouth and a cotton-wrapped probe into the nostrils. If there is valid ground for thinking that much liquor amnii and vaginal mucus has entered the trachea, then a catheter should be passed into the trachea and suction be exerted. As a rule, however, this will not be requisite, since either of the methods of artificial respiration we shall shortly describe causes the expulsion of detritus from the trachea and upper bronchi.

The mouth and the nostrils having been cleansed, a piece of muslin should be applied over the infant's mouth, and, whilst its nostrils are being compressed, the physician should apply his mouth over the child's and slowly breathe into it, then depress the infant's thorax and again breathe in. This mouth-to-mouth insufflation we much prefer to attempts at insufflation by means of the catheter, and often, if persisted in, we shall be able to resuscitate the infant in this way alone, especially if we are dealing with the apoplectic type. If the type is anæmic, then we question if over-anxiety and resort to active measures do not kill many an infant. As we have stated, the anæmic infant is suffering from shock, and the measures which suggest themselves are similar to those we would resort to were we dealing with an adult. Heat to the surface, the injection into the rectum of a pint of hot (115° F.) saline (2 per cent.) solution, the instillation into the mouth of 10 drops or so of brandy,—such are the primary measures of utility. If we seize such an infant and plunge it into hot water and then apply ice to its surface and then spank it or hold its head down, exposed to the chill of the room, the chances are that we shall not be able to resuscitate it. Calm demeanor and absence of overhaste will do the child more good if the simple measures we have outlined are resorted to.

In case of an apoplectic infant we need not worry so much over attention to bodily warmth or stimulation. What this child needs is resort to measures which are going to cause it to breathe deeply, the result being relief of congestion through proper oxygenation of the blood, and, in consequence, vigorous heart-action, since, concomitantly, the venous engorgement of this organ is relieved. Here then, after cleansing the mouth and the nostrils, it is well to resort to one or another of the methods of artificial respiration.

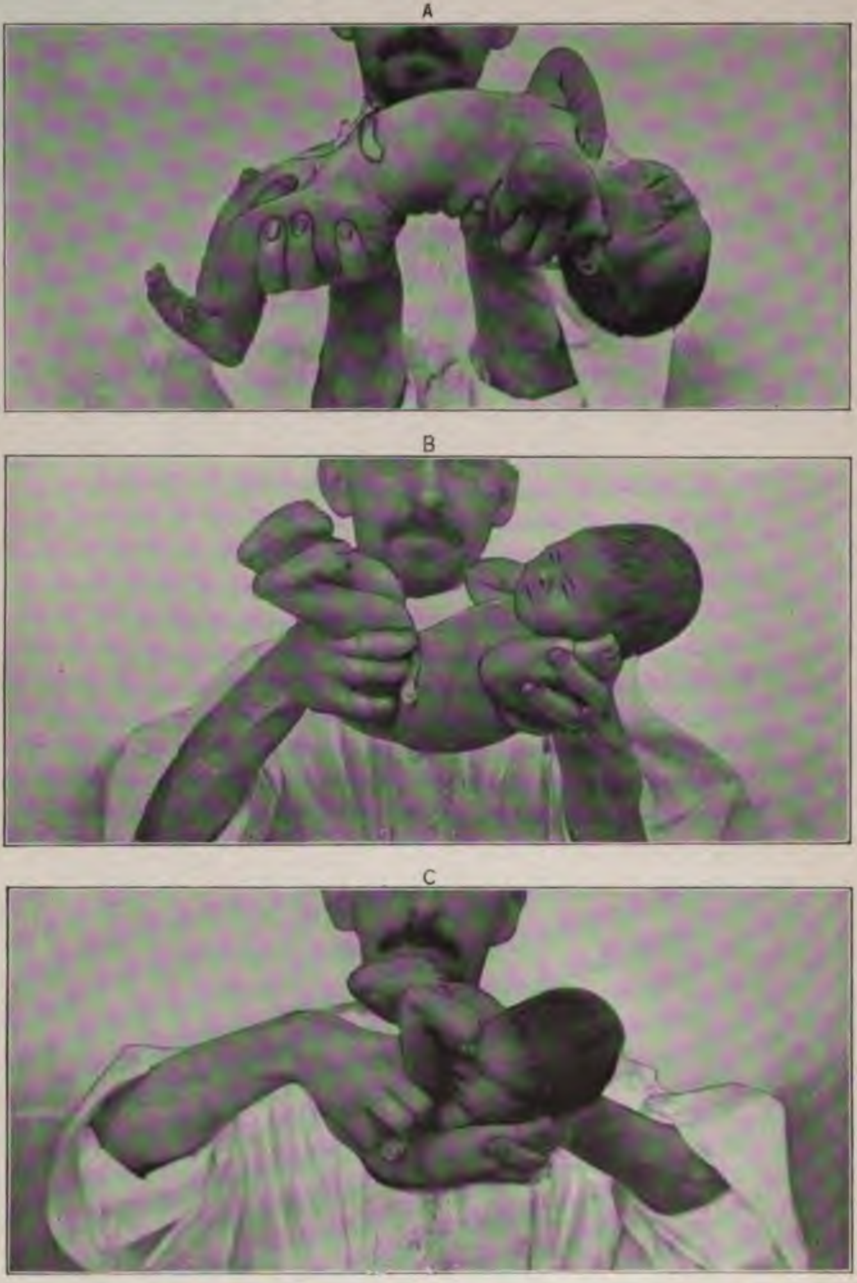
The two methods of artificial respiration with which the student should familiarize himself are the Schultze and the Byrd, the latter having been of late years resuscitated and advocated by Dew; and we therefore prefer to give it the name of the Byrd-Dew method, since Dew unquestionably independently systematized the method which Harvey Byrd, of Baltimore, described a quarter of a century ago.

Schultze's method is an excellent one. It aims at producing alternate expansion and compression of the thoracic walls, thus imitating nature's respiratory acts. Further, the descent of the diaphragm is favored and the necessary associated compression of the abdominal walls drives the diaphragm upward in the expiratory act, and thus the lungs are alternately expanded and compressed. The child is grasped just below the neck, the fingers resting on the dorsum and the thumbs on the thorax. The first motion is to hold the child downward and then the second motion is to swing the child upward and backward over the head, thus flexing the lower extremities on the abdomen. These alternating movements are repeated at intervals, and may be followed by the restoration of the function of respiration.

Practically, the Byrd-Dew method accomplishes the same effect as the Schultze, but it has the decided advantage that the steps of the method may be followed whilst the surface of the child is kept beneath hot water,—a necessary accompaniment in cases where we are dealing with the anæmic type of asphyxia or where the stimulus of heat to the body is otherwise desirable.

The infant is grasped with the left hand, with the neck resting between the thumb and forefinger, the head falling far over backward, the upper portion of the back and the scapulæ resting in the palm of the hand, the other fingers in the axilla lifting the arm up-

## PLATE XXX.



*The Byrd-Dew Method of Artificial Respiration.*
*A. Extension.* *B. Semi-flexion.* *C. Complete Flexion.*

ward and outward, and with the right hand grasping the knees (if the infant is small, the ankles) between the fingers, the thighs resting in the palm of the hand. (Plate XXX.)

Then to induce inspiration depress the pelvis and lower extremities, allowing the abdominal organs to drag the diaphragm downward; and with the left hand gently flex the dorsum backward. This lifts and separates the ribs like the segments of a fan.

To excite expiration reverse the movement bringing the shoulders and chest forward, closing the ribs upon each other, and at the same moment bring forward the thighs, resting them upon the abdomen. This movement crowds together the contents of the thoracic and abdominal cavities, resulting in a most complete and forcible expiration, while, at the same time, it empties the great blood-vessels of their engorged venous supply and relieves the right heart. In short, not only is the following inspiratory act rendered more decided as a consequence of this perfect expiratory movement, but a distinct suction effect is excited, in a most beneficial way, on the thoracic circulation.

During these manipulations, which may be repeated from six to eight times a minute, the air may be heard entering the trachea during the inspiratory act, and on resorting to the expiratory movement not only is the air driven out, but also any mucus or liquor amnii which may have entered the air-passages.

One or the other of these methods, associated with mouth-to-mouth insufflation, will result in the resuscitation of the majority of infants who are suffering from the effects of the venous form of asphyxia. The methods are tedious, but they should be kept up so long as there is the slightest audible heart-beat. Of the two methods, the Byrd-Dew has answered best in our hands, for the reason that other restorative measures can be resorted to at one and the same time. The ordinary Marshall-Hall or the Sylvester method presents no advantage over those we have described; indeed, in infants, we question if they possess the same advantages that they do in adults.

A further method worthy of trial is the recently resuscitated one of promoting respiration by traction on the tongue. The tongue is grasped by a vulsellum forceps and, at intervals of three to six times to the minute, it is drawn outward and then allowed to return to its natural position in the mouth. This traction is supposed to set up reflex respiratory action, and may be stated as of value as an adjuvant to the Byrd-Dew method.

In case of the anæmic type of asphyxia, when the prognosis is always worse, the Sylvester method, with the infant's body held in a tub of warm water on the hands of the nurse, or else the Byrd-Dew method similarly applied, should be preferred. It must be remembered that, in this form of asphyxia, the surface of the body of the child must be kept warm, in order to enable it to emerge from the condition of acute shock, so to speak, in which it is.

### INJURIES OF THE NEWBORN.

Injuries to the skull may result from pressure exerted by the forceps or by forcibly dragging the head through a contracted pelvis. They vary from simple fissure to depression and fracture. The diagnosis is self-suggestive and, unless accompanied by cerebral hæmorrhage, they are rarely fatal. The simple fissures and spoon-shaped depressions take care of themselves, unless associated with cerebral hæmorrhage, when the surgeon should be called in. Under the latter contingency, the continued pressure will cause degenerative changes in the brain, ultimately resulting in idiocy. Convulsions of an epileptic character may follow, and, in any event, the child will be feeble-minded.

Cephalo-hæmatomata may be due to lesions in the skull or be the result of pressure by the forceps. They are not as diffuse as the *caput succedaneum*, and are limited within the sutures since the hæmorrhage is between the periosteum and the bone. As a rule they become absorbed, often after a protracted period. Unless distinct evidence of suppuration supervene, they should not be interfered with surgically. The therapeusis is simply expectant.

Facial paralysis is a frequent complication, due usually to pressure by the forceps. The prognosis is good, the paralysis as a rule disappearing after a few days. When the lesion is accompanied by hæmorrhage over the parotid gland, it takes longer to cure and this may be hastened by the application of an ointment of the iodide of lead, or a 5-per-cent. ichthyol salve.

A further and less frequent complication is the effusion of blood into and around the sterno-cleido-mastoid muscle. The end result is disappearance, although occasionally a permanent torticollis follows. Massage, hot applications, and the administration of grain doses of the iodide of soda three times daily are assistant adjuvant measures.

There are many lesions which preclude the possibility of the child's survival. These are: Fractures of the atlas or axoid; fractures of the vertebræ with extensive hæmorrhages; and, as an associate of deep asphyxias, hæmorrhage into and around the liver, the kidneys, and the suprarenal glands.

Fractures of the long bones will rarely ensue where labor is conducted along the normal mechanism, and direct forcible pressure is usually at the bottom of the lesion. If care be taken during delivery, to make pressure only in the neighborhood of the joints, these injuries may usually be avoided. The treatment is correct apposition and the adjustment of a suitable splint.

Of great importance, because of the grave prognosis, is infantile or Erb's paralysis: Trauma, with or without hæmorrhage, along the course of the brachial plexus, is the etiological factor; atrophy and paralysis along the course of the deltoid and the neighboring group of muscles, is the result. Differential diagnosis must be made from fracture of the head of the humerus and from separation of the epiphysis. The inward rotation of the humerus and hyper-pronation of the forearm makes the diagnosis. The prognosis is often bad, particularly where faradic reaction does not occur soon. Permanent atrophy and useless condition of the arm arises.

Lacerations of the floor of the mouth and fractures of the lower jaw ensue as the result of faulty delivery of the after-coming head. These may be avoided by using suprapubic pressure instead of traction, and when the latter is necessary by applying it below the nostrils instead of through the mouth.

Wound infection of the newborn arises from a septic mother, or through the stump of the umbilical cord, or through abrasions in the mouth or other soft parts. Erysipelas is likely to develop with almost absolute fœtal death.

If the umbilical cord be not treated after the fashion already described, and if the umbilicus, after separation of the cord, be not maintained aseptic, septicæmia of the newborn may ensue with fatal result. The local signs are pronounced: The umbilicus is red and œdematous; foul smelling pus is secreted; red streaks emanating from this point show septic phlebitis and arteritis, leading to infarcts in distant organs, such as the lungs and liver. In warm climates tetanus follows. The therapeusis is a futile one.

# PART III.—The Puerperal State.

THE NORMAL PUERPERIUM.

THE PATHOLOGICAL PUERPERIUM.

# CHAPTER IX.

## THE NORMAL PUERPERIUM.

The puerperal state can only be physiological where the woman is uninfluenced by other than natural environments. The Indian squaw, in the early history of this country, gave birth to her child without delaying her companions when on the march, and was able at once to join them in their journey. To-day we have to deal with an entirely different being. Woman has inherited from her ancestors a physical organism so far removed from that belonging to the savage that what was once a physiological act, pure and simple, now verges on the pathological. Indeed, it requires the astuteness of the careful physician to recognize deviations from what should be normal and yet what is too frequently pathological.

The puerperium comprises the period beginning with the end of the third stage of labor and terminating when the woman returns to her normal state of health. It is impossible to accurately define the length of time the puerperal state covers, since so many conditions influence this interval. The process of labor involves an enormous amount of muscular energy, loss of blood and strength, and therefore it is followed by exhaustion to a greater or less degree. The frequently necessary exposure of a portion of the body, together with the rapid evaporation of heat from portions which are wetted, results in loss of tone, which is manifested, often, by a sense of chilliness or even by a decided chill. This chill is, however, of no special significance, being unaccompanied by rise of temperature. The pulse, which during the act of labor has become accelerated, slows down and becomes regular, falling as low, frequently, as fifty beats to the minute. This is of good prognostic omen, and the careful physician will always watch his patient when the reverse holds true. Undue acceleration of pulse is an indication of impending hæmorrhage or of exhaustion.

In case the labor has been tedious we may witness, during the twelve hours following delivery, a rise of temperature to 100° F. After this period the temperature should not rise above 99° to 99.5° F. unless there be some complication impending or existing. Before the days of asepsis during labor and the puerperal state the physician rather expected a rise of temperature about the third or the fourth day. Indeed, this occurrence was so constant that it was ascribed to the filling of the breasts, and it received the name of "milk fever." To-day, however, where asepsis is carefully maintained this rise of temperature is not noticed except in instances where the intestinal tract is clogged, and then it is due to absorption of waste products. A laxative reduces the temperature to the normal.

Inability to empty the bladder is a frequent and annoying complication of the early puerperal state. This is often due to the fact that the woman is unable to empty her bladder in the recumbent position. Again, the œdema of the vestibule may partially occlude the calibre of the urethra and offer such an amount of obstruction that the somewhat paralyzed bladder cannot empty itself. The bladder should receive attention at least every eight hours, and where it is necessary to catheterize the nurse should be instructed to do so by sight after precedent asepsis of the vestibule.

Involution of the uterus begins coincidently with the process of labor. The firm contractions of the muscular fibres necessitate waste and at the same time the lessened blood-supply causes fatty degeneration to set in. Coincidently with this fatty degeneration new cells are being formed; that is to say, the degenerative and the regenerative processes go hand in hand. The uterus thus diminishes in size and its walls increase in density. It requires about two months for this process of regeneration to be accomplished, and yet the uterus never returns to the size it had before conception. It always remains larger and heavier except in those rare instances where excess of involution occurs.

Immediately following delivery the cervix is soft and its canal is patulous. It is difficult to define the margin of the cervix, it being apparently merged in the vaginal walls. Twenty-four hours after delivery the cervix becomes well defined, although the canal is still patulous. At the end of two weeks the cervix has regained much of its normal shape, the external os still admitting the tip of the finger, although the internal os should be closed. The original size and appearance of the cervix is never regained. The external os, instead of being round, presents a transverse slit, except in instances where it has been lacerated to a greater or a less degree and has not healed, in which case the appearance may be most varied according to the degree of laceration.

During the eighth month of pregnancy certain of the uterine sinuses become obliterated through the coagulation of the blood. After delivery the blood coagulates in the remaining sinuses. Their walls become thickened through the development of new connective tissue. This tissue contracts until the sinuses are completely obliterated. This process is necessarily gradual and the obliteration is not completed for some months after delivery.

After delivery the vagina is relaxed and the site of abrasions vary in depth and in distribution. In case laceration has not occurred, or where this has been immediately repaired, involution proceeds rapidly. The vagina, however, never returns to its original size. About six weeks are requisite for involution to be completed.

The repair of the uterine mucous membrane is coincident with involution. The superficial layer of the decidua is in great part detached with the membranes and the placenta. During the few days following delivery the attached fragments of the superficial layer are shed with the lochia. The shortening of the muscular fibres of the uterus forces the utricular glands into a more perpendicular direction and crowds them closely together. As occurs after a thorough curetting of the uterine cavity, the epithelium of the glands proliferates and soon lines the ducts and thence the uterine cavity. This process requires about six weeks for its completion.

The placental site is repaired more slowly than the remainder of the cavity.

For the first few days after the delivery the uterus undergoes contractions of a similar nature to those which assist in the expulsion of the fœtus, although far less intense, and these contractions are known as "after-pains." These pains occur in inverse ratio to the length of labor, and are therefore more frequent in multiparæ than in primiparæ. Their presence is salutary, since they insure the maintenance of firm contraction of the uterus. Where the uterus remains soft after delivery and fills with blood-clots these contractions are very troublesome and will call for alleviation. Either the triple bromides in 10-grain doses each will allay these after-pains, or chloral hydrate in 10-grain doses, repeated every two or three hours. Massage of the uterus, by causing it to contract and expel the accumulated clots, will check the pains.

The discharge from the vagina following labor is termed the "lochia." At the outset the lochia is red and is largely composed of blood. After a few hours, however, the discharge will contain fragments of the membranes and of the placental decidua, as also the secretion from the vagina and the cervix. During the first three days after delivery so much blood is present in the discharge that the term "rubra" is applied to the lochia. As the amount of blood diminishes and the serous element increases the lochia becomes pale red and the term "serosa" is applied to it. This color lasts until about the sixth day. The lochia then consists of serum containing fat-globules and exfoliated epithelium. The color becomes grayish white and the term "alba" is applied to it. At the outset the reaction of the lochia is alkaline, but during the second week it becomes neutral or acid.

The amount of lochia varies greatly in different women. Women who do not nurse their infant and those who normally menstruate freely will have a greater flow. The average quantity during the eight days following delivery has been estimated as being about three and one-fourth pounds, of which the lochia rubra is about two pounds.

Where strict asepsis is observed during the puerperal state the lochia should never have any odor except a slightly stale smell as the discharge decreases in amount.

After the completion of the third stage of labor the uterus can be felt as a hard, firm body through the abdominal wall. It is somewhat pyriform in shape and extends to a point a trifle above a line midway between the symphysis and the umbilicus. The organ is slightly anteflexed and measures about six inches in depth. It is about four and one-half inches in width. Where the rectum and the bladder are full the uterus may be deflected toward the right side and backward. During the twenty-four hours following delivery the uterus ordinarily markedly lessens in size. Relaxation during this period and consequent increase in size is frequently dependent on a full bladder. Involution of the uterus normally progresses so rapidly that about the tenth day the fundus will be found below the level of the symphysis.

From the very beginning of pregnancy the breasts undergo developmental changes which fit them for the secretion of milk. This process of change is gradual and progressive and becomes completed about the first week after delivery. It will be recalled that the breasts are glands of the compound-racemose variety. The gland-structure itself is covered by smooth, delicate skin, and underneath this is a layer of adipose tissue. The glandular structure consists of lobes, lobules, and acini. Canaliculi start from the acini and anastomose to form the canals of the lobules. These canals unite in turn to form a canal for each lobe, and this is termed the "lactiferous duct." The lactiferous ducts terminate in the nipple by small openings, about one-fortieth of an inch in diameter. As the duct passes downward from the nipple it enlarges into what is termed the sinus of the duct. The space between the lobes is filled in with adipose tissue and the whole structure is firmly held together by connective tissue.

The breasts enlarge and grow more firm during pregnancy, from the accumulation of fat between the lobules and the development of new acini. The fluid which is secreted before and during the first few days of the puerperium is known as colostrum. It contains fat, albumin, salts, sugar, water, and large bodies known as colostrum-corpuscles. These latter are derived from the disintegration of the epithelium which lines the acini. This colostrum has a laxative action, and cleanses the intestinal canal of the infant in order to prepare it for the milk, which is secreted about the third day. The early milk does not contain as large an amount of solids as the later, the fluid altering in density as the gastric capacity of the infant becomes better able to assimilate it.

The care which the newborn infant should receive has been dwelt upon in the chapter devoted to that subject. During the first four to six days of its existence the infant will decrease in weight, owing to the small amount of nourishment which it receives. This loss should be gradually recovered, the original weight being regained about the seventh to the ninth day after delivery. The infant's head gradually regains its shape, and the swelling of the presenting part subsides in a few days. At the end of two or three days exfoliation of the epithelium begins and continues for seven or eight days. During this period icterus not uncommonly sets in and, as a rule, passes off without remedy being indicated. In the event of its becoming deeper, then a mild laxative will assist in its disappearance where organic cause does not exist. A not infrequent phenomenon is acute congestion of the mammary glands, and this may occur not alone in the female, but also in the male infant. This is a physiological occurrence and yet, if improperly treated, it may become pathological, that is to say, the glands may suppurate. The treatment is application of an ointment of atropine, grain one to the ounce. Firm compression is then applied by means of a breast binder. Injudicious massage does harm.

## Management of Convalescence.

Before leaving the woman, after delivery, the physician should carefully examine her. He should satisfy himself that the uterus has remained firmly contracted. He should look at the vulvar pad to see that the flow of blood is no more than what is natural. This is especially requisite, because, even though the uterus may be firmly contracted, hæmorrhage may be occurring from a lacerated cervix or from some portion of the vagina. He should note the condition of the pulse and respiration. A slow and regular pulse is what we should expect to find unless the woman is greatly exhausted or is losing an undue amount of blood.

The physician should remain by his patient for at least one hour after delivery. Before leaving, written directions should be given the nurse or attendant in regard to the method of controlling hæmorrhage should it occur. The woman should be allowed to rest quietly for a number of hours after delivery, and ordinarily she will sleep. After about four hours the infant should be applied to the breast. This causes contraction of the uterus and assists in maintaining the organ firm.

The diet of the lying-in woman should be bland for the first few days. Milk and light soups are preferable. After the bowels have been thoroughly cleansed and the milk is beginning to be secreted there is nothing gained by the starving process of the past; indeed, much is lost. The woman needs food not only for recuperative purposes, but also to enable her to stand the strain of lactation. Where the course of the puerperium is smooth solid food may be administered carefully after the second or the third day. The amount will vary according to the desire of the woman, and never to the exclusion of milk.

A laxative should be administered the evening of the second day, at least, since the puerperal state will progress to better advantage in case the intestines are kept unclogged. In case the woman is of the constipated type, this laxative should be given twenty-four hours after delivery. Whilst normal evacuations should be secured daily, hypercatharsis should be avoided except it be desired to diminish the flow of milk.

In case the woman finds it difficult to empty her bladder or her rectum in the recumbent posture she may be allowed to sit upon the bed-pan whenever there is no contra-indication from the side of the heart. The popular idea that the woman should maintain the recumbent posture for days after delivery is erroneous. It has been experimentally proven that, where the pulse is slow and regular, it does the woman no harm to begin to assume the semi-recumbent posture within twenty-four hours after delivery. Involution progresses as normally and drainage is better. After the fourth day the woman will be able to assume this posture for the greater part of the day, and the result will be that, when the time arrives for her to leave her bed, she will be in better physical condition.

The consensus of opinion would seem to be that ergot should be administered as a routine measure for the week following delivery. The drug seems to favor involution and the uterus is certainly prevented thereby from relaxing. Thirty drops of the fluid extract may be ordered three times daily. A sixtieth of strychnia three times daily would appear to favor involution. Occasionally ergot disagrees, sometimes causing nausea or cerebral disturbance, and then our reliance is on strychnia, in grain $^1/_{30}$ dosage three to four times daily, and on quinine in small dose, 2 grains every four to five hours.

The physician should see his patient at least eight hours after delivery and should then note the state of the uterus, the amount of lochial discharge, and inquire as to whether the bladder has been emptied or not. For the three days after delivery it will be wise to see the woman, when possible, twice daily, since this is the period when untoward change is apt to occur. The temperature and the pulse should be taken morning and evening for the first week. The nurse or attendant should be instructed to exercise the most absolute cleanliness before touching the woman. She should be instructed to wash her hands and to dip them in a solution of bichloride of mercury 1 to 5000 before changing the vulvar pad and before washing the genitals. The old-fashioned napkins should not be allowed in the lying-in room. Absorbent cotton baked in the oven, or, in the households of the indigent, cloths boiled before use, should take their place. In the households of the well-to-do the sanitary napkins, which may now be obtained everywhere, should be used. They should also be baked in an oven before use. These pads should be changed as frequently as they become saturated. The external genitals should be bathed frequently, a solution of bichloride, 1 to 5000, being used, or a 1-per-cent. solution of creolin. Vaginal douches are never indicated in the normal puerperium; indeed, their routine administration adds to the danger of infecting the woman. The indication for the vaginal douche is odor to the lochia, which is possibly due to the decomposition of a clot in the vagina. In case the odor persists, then the indication becomes stringent to examine the woman carefully for the early detection of a beginning sapræmia. In case a vaginal douche seems indicated it should be administered with absolute asepsis, as is fully exemplified in the chapter dealing with obstetric asepsis (*vide* "Obstetric Surgery"). An intra-uterine douche should never be administered by the nurse or the attendant, but always by the physician, who alone is competent. The indication for such douche will, as a rule, be odor to the lochia which persists after vaginal douching.

The physician who is careful to persuade every healthy woman to nurse her child will do much toward lowering the mortality-rate of children under five years of age. The woman who is not willing to sacrifice social pleasures and personal comfort for the benefit of her child is unworthy to become a mother. Mothers' milk constitutes the natural food of the infant and nothing has been found which will in every respect take its place. Of course, where the maternal condition will not allow of lactation, either because of imperfect development of the mammæ or because of organic disease, the woman cannot properly nourish her offspring, in which case artificial means must be resorted to. When the woman suffers from the distension associated with an excess of milk the application to the breasts of hot cloths for ten minutes, and repeated at intervals, may relieve her; or, what is preferable, the nipples should be covered with a pledget of sterile gauze and a firm compression binder should be applied. The breasts will often thus empty themselves under this pressure. At the same time the amount of fluid taken by the woman should be diminished. In the event of there being an insufficient supply of milk or a diminution in the amount, a strong infusion of the milk-plant—the *Galega officinalis*—may be ordered in tablespoonful doses three to four times daily. At times there will result an increased supply. The powdered extract of the seed of the cotton plant, in drachm doses three times daily, is also worth trial. The application of pure castor oil to the breast is a valuable adjuvant.

The period when the woman should be allowed to leave her bed is very variable. As a rule, the uterus has involuted below the pelvic brim by the tenth day, and the woman may be allowed to leave the bed and to spend a portion of the day on a lounge. She should not be allowed to walk until the fourteenth day, and then after a gradual fashion. As long as the uterus has not involuted below the pelvic brim, in particular if the red lochia tend to recur on much exertion, it is wise to limit the exercise which the patient will take, and often it may be necessary to keep her in bed. It is the after-care which the woman receives which tends to allow the uterus to return to a fairly normal condition after labor, and which will do much toward the prevention of uterine diseases, in particular uterine displacements.

The resumption of sexual intercourse should not be permitted until after the second month, since the pelvic congestion which the act entails interferes with proper involution of the pelvic organs.

# CHAPTER X.

## THE PATHOLOGICAL PUERPERIUM.

THE boundary-line between the physiological and the pathological puerperiums is rarely sharply defined. It has been seen that, under normal conditions, the retrograde phenomena of the puerperal state are not constant in their course, largely because the woman never can approach labor in the *ideal* condition. We can hope, therefore, only to lay down approximate rules for the determination of the minor deviations from the physiological puerperium, laying stress on the fact that watchful care will rarely overlook excess in these boundary-line phenomena, since on early recognition and on prompt treatment will depend the aborting of major complications.

Prophylaxis, armed expectancy,—such should be the rôle and the attitude of the physician during the puerperal state.

At the outset, a few words giving the consensus of belief in regard to that important topic.

*Bacteriology.*—Beginning with woman at the time of conception, it may be stated that in the normal vagina we find a secretion which possesses an inhibitory effect upon pathogenic organisms—streptococci, staphylococci, and the colon bacillus. This secretion is markedly acid, sticky, and gelatinous. The inhibitory effect depends upon lactic acid emanating from the Doederlein bacillus. The presence of this secretion may be determined by sight and by touch, and we may vouch for the fact that the given vagina is surgically aseptic, requiring no artificial preparation, to avoid the woman becoming infected from within herself, so to speak. The corollary is that in the healthy vagina neither the staphylococcus albus nor aureus nor the streptococcus nor the bacterium coli can develop or survive. They are destroyed by the lactic acid-producing the first few days of the puerperium is known as colostrum. It contains fat, albumin, salts, sugar, water, and large bodies known as colostrum-corpuscles. These latter are derived from the disintegration of the epithelium which lines the acini. This colostrum has a laxative action, and cleanses the intestinal canal of the infant in order to prepare it for the milk, which is secreted about the third day. The early milk does not contain as large an amount of solids as the later, the fluid altering in density as the gastric capacity of the infant becomes better able to assimilate it.

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In case the woman finds it difficult to empty her bladder or her rectum in the recumbent posture she may be allowed to sit upon the bed-pan whenever there is no contra-indication from the side of the heart. The popular idea that the woman should maintain the recumbent posture for days after delivery is erroneous. It has been experimentally proven that, where the pulse is slow and regular, it does the woman no harm to begin to assume the semi-recumbent posture within twenty-four hours after delivery. Involution progresses as normally and drainage is better. After the fourth day the woman will be able to assume this posture for the greater part of the day, and the result will be that, when the time arrives for her to leave her bed, she will be in better physical condition.

The consensus of opinion would seem to be that ergot should be administered as a routine measure for the week following delivery. The drug seems to favor involution and the uterus is certainly prevented thereby from relaxing. Thirty drops of the fluid extract may be ordered three times daily. A sixtieth of strychnia three times daily would appear to favor involution. Occasionally ergot disagrees, sometimes causing nausea or cerebral disturbance, and then our reliance is on strychnia, in grain $^1/_{30}$ dosage three to four times daily, and on quinine in small dose, 2 grains every four to five hours.

The physician should see his patient at least eight hours after delivery and should then note the state of the uterus, the amount of lochial discharge, and inquire as to whether the bladder has been emptied or not. For the three days after delivery it will be wise to see the woman, when possible, twice daily, since this is the period when untoward change is apt to occur. The temperature and the pulse should be taken morning and evening for the first week. The nurse or attendant should be instructed to exercise the most absolute cleanliness before touching the woman. She should be instructed to wash her hands and to dip them in a solution of bichloride of mercury 1 to 5000 before changing the vulvar pad and before washing the genitals. The old-fashioned napkins should not be allowed in the lying-in room. Absorbent cotton baked in the oven, or, in the households of the indigent, cloths boiled before use, should take their place. In the households of the well-to-do the sanitary napkins, which may now be obtained everywhere, should be used. They should also be baked in an oven before use. These pads should be changed as frequently as they become saturated. The external genitals should be bathed frequently, a solution of bichloride, 1 to 5000, being used, or a 1-per-cent. solution of creolin. Vaginal douches are never indicated in the normal puerperium: indeed, their routine administration adds to the danger of infecting the woman. The indication for the vaginal douche is odor to the lochia, which is possibly due to the decomposition of a clot in the vagina. In case the odor persists, then the indication becomes stringent to examine the woman carefully for the early detection of a beginning sapræmia. In case a vaginal douche seems indicated it should be administered with absolute asepsis, as is fully exemplified in the chapter dealing with obstetric asepsis (*vide* "Obstetric Surgery"). An intra-uterine douche should never be administered by the nurse or the attendant, but always by the physician, who alone is competent. The indication for such douche will, as a rule, be odor to the lochia which persists after vaginal douching.

The physician who is careful to persuade every healthy woman to nurse her child will do much toward lowering the mortality-rate of children under five years of age. The woman who is not willing to sacrifice social pleasures and personal comfort for the benefit of her child is unworthy to become a mother. Mothers' milk constitutes the natural food of the infant and nothing has been found which will in every respect take its place. Of course, where the maternal condition will not allow of lactation, either because of imperfect development of the mammæ or because of organic disease, the woman cannot properly nourish her offspring, in which case artificial means must be resorted to. When the woman suffers from the distension associated with an excess of milk the application to the breasts of hot cloths for ten minutes, and repeated at intervals, may relieve her; or, what is preferable, the nipples should be covered with a pledget of sterile gauze and a firm compression binder should be applied. The breasts will often thus empty themselves under this pressure. At the same time the amount of fluid taken by the woman should be diminished. In the event of there being an insufficient supply of milk or a diminution in the amount, a strong infusion of the milk-plant—the *Galega officinalis*—may be ordered in tablespoonful doses three to four times daily. At times there will result an increased supply. The powdered extract of the seed of the cotton plant, in drachm doses three times daily, is also worth trial. The application of pure castor oil to the breast is a valuable adjuvant.

The period when the woman should be allowed to leave her bed is very variable. As a rule, the uterus has involuted below the pelvic brim by the tenth day, and the woman may be allowed to leave the bed and to spend a portion of the day on a lounge. She should not be allowed to walk until the fourteenth day, and then after a gradual fashion. As long as the uterus has not involuted below the pelvic brim, in particular if the red lochia tend to recur on much exertion, it is wise to limit the exercise which the patient will take, and often it may be necessary to keep her in bed. It is the after-care which the woman receives which tends to allow the uterus to return to a fairly normal condition after labor, and which will do much toward the prevention of uterine diseases, in particular uterine displacements.

The resumption of sexual intercourse should not be permitted until after the second month, since the pelvic congestion which the act entails interferes with proper involution of the pelvic organs.

# CHAPTER X.

## THE PATHOLOGICAL PUERPERIUM.

The boundary-line between the physiological and the pathological puerperiums is rarely sharply defined. It has been seen that, under normal conditions, the retrograde phenomena of the puerperal state are not constant in their course, largely because the woman never can approach labor in the *ideal* condition. We can hope, therefore, only to lay down approximate rules for the determination of the minor deviations from the physiological puerperium, laying stress on the fact that watchful care will rarely overlook excess in these boundary-line phenomena, since on early recognition and on prompt treatment will depend the aborting of major complications.

Prophylaxis, armed expectancy,—such should be the rôle and the attitude of the physician during the puerperal state.

At the outset, a few words giving the consensus of belief in regard to that important topic.

*Bacteriology.*—Beginning with woman at the time of conception, it may be stated that in the normal vagina we find a secretion which possesses an inhibitory effect upon pathogenic organisms—streptococci, staphylococci, and the colon bacillus. This secretion is markedly acid, sticky, and gelatinous. The inhibitory effect depends upon lactic acid emanating from the Doederlein bacillus. The presence of this secretion may be determined by sight and by touch, and we may vouch for the fact that the given vagina is surgically aseptic, requiring no artificial preparation, to avoid the woman becoming infected from within herself, so to speak. The corollary is that in the healthy vagina neither the staphylococcus albus nor aureus nor the streptococcus nor the bacterium coli can develop or survive. They are destroyed by the lactic acid-producing bacillus should they gain accidental entry. The vagina, therefore, is sterile from the start under normal conditions. The condition alters when Doederlein's bacillus is not present. And here we approach the pathological. Then the secretion of the vagina is alkaline, fairly profuse in amount, foul smelling and purulent. Often the condition is due to the gonococcus.

While these views hold for the vagina, it is far different as regards the external genitals. Cultures from the vulva always contain staphylococci and the bacterium coli commune, and the corollary is that precedent to labor this territory must be rendered aseptic in order that the puerperium may not become pathological.

As regards the puerperium, the researches of Marx and many others teach us that the uterus is a sterile organ even as is the vagina. In clinics and in maternity hospitals control tests may be made if deemed wise, but the exigencies of the life of the general practitioner and his laboratory facilities, forbid the bacteriological and culture tests; therefore, it is a comfort to him to be assured that Nature protects the normal woman against infection, and that all he has to do is to forbear carrying infection himself. Should the individual desire, or if he have the facilities for making bacteriological tests, he may rest assured that the presence of bacteria in the puerperal uterus, in the absence of evidence of constitutional disturbance, from the side of the pulse and the temperature curve, means accidental contamination. Further, the presence of bacteria, associated with signs of constitutional disturbance, means, probably, sepsis emanating from the uterus. Finally, the absence of bacteria in the puerperal uterus in the presence of constitutional disturbance, tells us to look elsewhere for the source—it may be vulva, or vagina, or lungs, intestinal canal, etc.

The therapeutic importance of these data will be dwelt upon in the proper place.

The student who has been grounded, as he should be, in the young science of bacteriology will appreciate the fact that the study of the pathological puerperium may be much simplified. Even though as yet the foundation of our modern belief may be in minor details a trifle insecure, the keystone is well laid, and on this is inscribed the words "wound infection" as the definition of alteration of the physiological into the pathological. A possible exception is termed sapræmia, although it may eventually result in septicæmia, and, when traced to its source, this is found to be dependent on the development or on the result of the activity of pathogenic organisms. That is to say, sapræmia following decomposition through infection becomes in import the same septicæmia which follows wound infection.

The term "puerperal fever" may still suffice for the laity. It can have but one meaning for the physician, and this is septicæmia, blood-poisoning, wound infection, the absorption of products of decomposition altered through infection into a virulent poison.

Whence the infection?

Three possible sources have been described and each, in turn, has carried weight in the past in the nosology of so-called childbed fever. These sources are: the atmosphere; the body of the puerpera; material of an infectious nature, or capable of causing infection, brought in contact with the genital system of the puerpera (including under this term the mammary glands).

Reference to the first two possible sources may well be brief, since modern knowledge and belief have relegated them well nigh to the shelf of oblivion, where they rest as evidence of past erroneous teaching.

Atmospheric infection of the puerpera as a cause of septicæmia, whilst a comforting belief, since it casts the responsibility on nature, is not a tenable one. Given a puerpera delivered after an aseptic fashion and cared for similarly afterward, and she may lie in an infected room—whether the infection be erysipelas, measles, scarlet fever, etc.—and the puerperium may be unaffected so far as septicæmia is concerned. She may develop either of these acute infectious diseases, but they run their proper course, only modifying the puerperal state in so far as arrest of retrograde metamorphosis is concerned. If she die, the lesions peculiar to the intercurrent disease will be found. Aside from arrest of involution of the sexual organs, we may find nothing suggestive of septicæmia. On the other hand, as will be noted shortly, let the erysipelas or the scarlet-fever infection material be brought into direct contact with the wounded genitals of the puerpera and septicæmia may follow, modified or not by the development of the infectious disease from which the contact-virus emanated. If she die, the lesions due to infection—the lesions of septicæmia—will be found in addition to those peculiar to the intercurrent disease; for instance, scarlet fever or erysipelas *plus* septicæmia.

For years the doctrine of auto-infection played a prominent rôle in the nosology of so-called puerperal fever. It was contended that the poison developed within the body of the puerpera and led to those pathological changes which resulted clinically in septicæmia. Such theory is untenable to-day, in view of the proven fact that spontaneous generation of disease is not possible, and, again, in view of the fact that the recognized causative agents of disease are never found in the healthy body.

Given a woman in good health, delivered aseptically and treated thereafter in the same manner, then, unless infectious material be brought to her, she will remain in the same state of health, the transient modifications being only such as are normally associated with the processes of normal retrograde metamorphosis in the puerperal state. Apparent exceptions are offered by those cases where, during labor or the puerperal state, an abscess of the ovary or of the tube ruptures, partly or in entirety, giving rise to a clinical symptomatology like that of puerperal sepsis. Unquestionably here the sepsis emanates from the body of the puerpera, but this is a pure epiphenomenon of the puerperium. Before labor, before pregnancy, the source of infection lay quiescent in the ovary or the tube, which had precedently been infected by the reception, perhaps, of gonorrhœic virus or as the result of a badly-managed abortion.

A further exception is apparently offered by instances of what has been termed sapræmia. A woman in good health is confined aseptically. By oversight a portion of placenta or of membrane is left in the uterus. This decomposes, and, if not removed, the woman becomes infected. But why does it decompose? Because, notwithstanding all our care, it has become infected. Scores of cases prove that such remnants are carried for days and finally shed without the woman suffering harm. Where they do affect her we will find that the reason is that infectious material has been brought to the woman's body and that these remnants have become infected. To go further, it has been proven that the organisms which produce putrefaction cause the development of ptomaines which may themselves be toxic. The modern consensus of opinion in reference to this matter may be summarized as follows:—

In putrefaction tissues micro-organisms are at the bottom of the process. Infectious material is thus produced, and, if the excretion of these substances is interfered with, septic infection results. Now, the very entrance of these micro-organisms interferes, or, rather, may interfere, with excretion, and, therefore, we possess in the body, under the given conditions of putrefaction, material which not alone may poison, but which may interfere with excretion, from which necessarily infection will result.

Thus far, then, our argument has shown that the source of puerperal sepsis must be looked for outside of the body of the puerpera, and we have determined that the infectious material must be brought to the body of the woman.

Let us recall the condition of the recently delivered puerpera. We assume that the act of labor has been conducted aseptically and that the accessible lesions of the genital tract have been repaired after established rules, in order to close every possible avenue for the entrance of infectious material. Still there remains a wounded surface which offers a site for infection, and this is at the placental insertion. Micro-organisms enter the genital tract and reach this site nothwithstanding every possible precaution taken by the physician. Now, if the body of the puerpera lack the requisite resisting power, if, in other words, she is in a condition below the normal, then, her resisting power to the onset of disease being lessened, these micro-organisms flourish, the soil they ingraft themselves upon being suitable for their growth. A living ferment is at work in the tissues. Destruction of tissue may take place, or else ptomaines and leucomaines are formed. The final result is the same: The production of infectious material which poisons the body of the puerpera and leads to the symptoms of septicæmia. As will be noted later on, these symptoms vary, in a measure, according to the point of entrance of the pathogenic bacteria, the effects being purely local at the start and being kept local through the proper treatment, or else the effects being generalized and most rapidly fatal in character.

Puerperal septicæmia, therefore, is never endogenous in origin. It is always exogenous; that is to say, emanates from without. Whence the corollary dwelt upon so frequently, that the most absolute asepsis should be associated with the conduct of labor and the care of the puerperal state; and whence the further corollary that, when puerperal sepsis develops, one or more of the attendants on the woman are culpable, even though the source or the manner of infection cannot be determined.

The careful student of bacteriology will remember that a number of pathogenic bacteria have been isolated, and that, through experimentation, we are in a position to-day to expect the development of certain specific symptoms if one or another kind of bacterium gain entrance to the system. In the neighborhood of forty have been isolated as being the source of septicæmic or pyæmic processes. The student is necessarily referred to works on bacteriology for a description of the bacteria, all that we aim at accomplishing here being to impress the fact that the clinical symptoms vary with the kind or the kinds of micro-organisms which have gained entrance into the system, with the nature of the soil where they have lodged,—whether rich in lymphatic supply, for instance, or not; and, finally, that the sum-total of the clinical symptomatology must necessarily depend on the resisting power of the person in whose body they have obtained foot-hold. A puerpera weakened by precedent disease obviously will resist the onset of these infectious elements to a far less degree than the woman who has reached her term and has passed through her labor with undiminished or, rather, unweakened vital forces. All this explains the degree of virulency which the same disease—septicæmia—offers in different women infected at the same time, and after the same fashion, and at a similar site. How far this resisting power depends on the action of the leucocytes of the body is yet to be proved through careful study and research. So much may be taken for granted now, and this is that these leucocytes appear to offer a barrier to the entrance of bacteria into the system and to oppose their progress when once they have gained a foot-hold. The teachings of modern pathology only render stronger the data established from clinical study of the disease known to-day as septicæmia.

The changes found after death are of the most varied type, and yet they are only similar to those which follow death from septic infection aside from the puerperal state. The accentuation of the lesions may be more marked around the genital tract, but the systemic findings are exactly alike in sepsis following an infected wound of the arm, leg, or face as after an infection of the puerperal tract. One great fact stands prominent, and this is that the lesions vary and are widely spread, according to the lymphatic supply of the part first affected. Remembering that, first, we need a wound or abrasion where the infection may enter, it is evident that any part of the genital tract may be the site of primary infection. The lacerated perineum or cervix, the wounded endometrium at the site of placental separation,—such are the obvious points of infection. Later on in the puerperal state the abraded nipple may become infected, giving rise to a mastitis with consecutive systematic infection.

When we remember the vascular supply of the sexual system, increased manifold during pregnancy, and when we recall the rich lymphatic supply of the same system, it is not surprising that infection, starting in this locality, should very readily spread to the various serous cavities of the body and be deposited by the veins in every organ.

According to the site of the primary infection the lesions at the start are diffuse or not. Systemic infection, we repeat, supervenes, with greater or less rapidity, according as the point of primary infection is rich or not in lymphatics. Thus, infection at a perineal laceration, even though it takes on the so-called diphtheritic type, through energetic and timely local treatment, may be checked prior to the occurrence of much systemic infection, and much more speedily than can infection emanating from a lacerated cervix or the body of the uterus. Here the lymphatic supply is so rich, leading to the tubes and ovaries and the peritoneum, direct extension through the tubes being further possible, that general systemic infection may be most rapid in character.

Even in the most rapidly fatal forms of puerperal infection, where the local and the systemic lesions do not have time to become sharply marked, we shall find the lymphatics and the veins affected.

From his studies in pathology the student has familiarized himself with the essential changes associated with septicæmia. Before passing in review the clinical features of puerperal sepsis we would again emphasize the fact that, pathologically, the affection entails simply the same changes as those which follow infection of a wound in any part of the body aside from the puerperal state.

Clinically, puerperal septicæmia offers a varying symptomatology, according as the infection affects chiefly one or another of the pelvic organs and according as the infection is detected early and treated promptly. It seems to us wise to study the disease as an entity, and not to confuse the student by endeavoring to sharply differentiate a symptomatology of one infected organ from another. Very rarely, indeed, will one organ be affected, or the part of one organ, without there being consecutive affection of another. Again, it is the exception that the symptoms of infection of the system at large do not predominate over the signs offered by the local lesion. Under the subjects of treatment and of prognosis we will dwell at length on the characteristics of the individual lesions. By following this course we best impress the fact that we are dealing really with a systemic affection, even though the starting-point be a local lesion.

We proceed to note the alterations in the customary phenomena of the puerperal state known as the normal phenomena, laying stress on the meaning of certain groups of symptoms (objective and subjective). The point to remember is that we may meet with septic vulvitis, vaginitis, endometritis, metritis, salpingitis, oöphoritis, peritonitis, cystitis, etc., and each may offer cardinal evidence of its presence; but the systemic disease is the same, the constitutional disturbance only varying according to the degree and the extent of the primal lesion.

Infection of the woman may occur before labor, during labor, or during the puerperal state.

Ante-partum infection is uncommon, but when it occurs the course is ordinarily very rapid and fatal; so that on autopsy but little evidence of systemic infection is found except that the lymphatics and the veins are affected. The woman never reaches the normal puerperal state. She is confined either in the midst of systemic septic disturbance, characterized by chill, high temperature, and rapid pulse, or else these symptoms follow closely on delivery. Instances of this nature are rare, except in times of epidemic, when one woman after another is rapidly infected and as rapidly dies. Nowadays such experiences are unheard of, and such an occurrence would reflect the most lamentable ignorance and the most culpable neglect.

As a rule, it is about thirty-six hours after delivery that the first symptoms of septic infection manifest themselves. Chill is by no means a marked precursory symptom except in the so-called fulminating types of sepsis, where the woman seems to pass from health into death. Very frequently, even though the woman has a chill, it passes unnoticed. The average puerpera reacts very readily to emotional disturbances, and, therefore, a chill, should it be noted, may have no significance of evil impending. Its occurrence should, however, awaken our anxiety, even as it would aside from the puerperal state. Its significance carries the same weight as it does when it ushers in any acute affection. It may mean a developing pneumonia, or, indeed, in paludal districts, it may be only something which the woman has for years suffered from at irregular intervals. If, however, it be followed by fever of a non-intermittent type, then, in the puerperal state, our first thought should be of septic infection.

The pulse-rate affords, as a rule, most valuable evidence of alteration in the smooth course of the puerperium. A slow pulse is incompatible with sepsis in its early stage. A rapid pulse is a danger-signal. Either hæmorrhage is impending or else it may be septic infection. Danger from hæmorrhage is practically at an end thirty-six hours after delivery, particularly if on palpation the uterus is found to remain hard. Where the pulse increases in frequency and the temperature rises above 99° to 100° F. about the third day, impending mischief of a septic nature may usually be suspected. Formerly, this constitutional disturbance was laid to the incoming of the milk,—the so-called milk fever. To-day such a fever is not recognized. The establishment of the function of lactation in a woman in good health is not accompanied by constitutional disturbance. A frequent cause of disturbance about the third day, however, is the fact that the intestinal tract has not been properly cared for. There is an absorption of intestinal products resulting from retained fæcal matter, and thence the rise in temperature and in pulse-rate. A laxative should clear the scene. If it does not, then, in case no intercurrent disease is developing, sepsis is.

At once the most careful examination of the woman is called for. Such examination should include all the organs of the body. The student should beware of jumping at the conclusion that he is dealing with saprophytic or streptococcic infection. The blood should be examined for the plasmodium of malaria, and the urine should be tested for excess of indican as pointing to intestinal toxæmia. The process of exclusion, so valuable to the careful clinician, is especially called for here. If the pelvic floor has been lacerated, sloughing in this locality may be found, or, possibly, the developmental stage of the so-called puerperal diphtheria. Should the pelvic floor be found unaffected, and if, on examination, the urine present none of the characteristics of a cystitis, then the cervix should be examined by speculum for sloughing process or similar pseudodiphtheritic appearance. This failing, the uterus must be carefully questioned. We are proceeding, in other words, by a process of exclusion, to establish at an early date the source of the infection whilst it is amenable, possibly, to local treatment; at any rate, before general systemic infection has progressed to a great degree.

Probably, in the vast majority of cases, septicæmia emanates from the uterus. Either its lymphatics have absorbed the septic virus directly or else a decomposing mass lies in its cavity and becomes infected. In the first instance we may have a rapidly supervening salpingitis and peritonitis; in the second instance we have, first, a sapræmia (a poisoning from the absorption of the products of decomposition), and, secondarily, a septicæmia with local lesion in the endometrium at the outset. If the process be not checked here, then, in succession, a metritis, a salpingitis, an oöphoritis, and a peritonitis may develop.

As a rule, it may be stated that the relation between the pulse and the temperature in the puerperal state is of exceeding value from a prognostic as well as a diagnostic stand-point. Acute septic conditions, where the system is surcharged, as it were, with the poison, are associated with great rapidity of the pulse and very low temperature. The system is deeply shocked by the poison; we have a condition of collapse, as it were, the temperature ranging about 99° to 100° F. and yet the pulse-rate averaging 120 to 140. A scene of this character carries the most gloomy diagnosis and prognosis. On the other hand, where the lesion is more of the acute inflammatory type and the systemic infection is slight, we are apt to have a high thermometric range, whilst the pulse remains relatively slow. Thus, in an endometritis, where the infectious lesion does not extend beyond to the tubes and the ovaries and the pelvic cellular tissue, we may note for days, until resolution, the temperature ranging from 103° to 104° F. whilst the pulse-rate remains at 115 to 120. The most virulent of all types of puerperal septicæmia—general purulent peritonitis—is usually associated with low temperature and high pulse-rate, and often, also, with flat instead of tympanitic abdomen. In short, in the puerperal state the pulse furnishes a more reliable prognostic guide than does the temperature.

Associated with rapid pulse and elevation of temperature the lochial discharge becomes altered. The lochia may be partially or altogether arrested; it may become foul, giving rise to what has been termed fœtor.

Arrest of the lochia may be the result of diminished excretion, the associate of the systemic infection, or the arrest may be only an apparent one, due to stenosis at the internal os with consequent retention and stagnation. In either event careful aseptic local examination will differentiate. If there be retention from flexion the examining finger will find the body of the uterus bent on the cervix at the level of the vaginal reflexion, and, if means be taken to straighten out the flexion, the lochia will again appear, whilst if there be arrest of secretion it will not. In the event of there being stagnation without septic infection, the constitutional disturbance will abate on the restoration of the flow. Diminished or impeded excretion of the waste products certainly causes systemic disturbance,—as is shown by the rapid pulse and the rise in the temperature, even aside from infection; but, in such a case, the temperature is apt to be high and out of proportion to the pulse-rate, whilst in deep systemic infection, as we have noted, the pulse is apt to be high relatively to the temperature. Should infection of the stagnant lochia ensue, then we may have consecutive infection of the tubes, ovaries, and peritoneal cavity.

Fœtor of the lochia is simply a sign of decomposition and is an accompaniment of sapræmia. A uterus may be infected and yet there may be no odor to the diminished lochial discharge. A sloughing pelvic floor or cervix may give rise to fœtor, and such a source should always be differentiated before we conclude that the uterine cavity is at fault. The most common source of fœtor is a portion of placenta or of membrane or a decomposing clot in the cavity of the uterus.

In this connection, then, it is to be remembered that the most acute type of sepsis may be absolutely unassociated with fœtor, whilst on the early recognition of fœtor and on its prompt treatment sapræmia may be aborted before it merges into a septicæmia.

In early sepsis pain is usually absent. As a rule, it becomes marked as the peritoneum becomes affected. Of course, pressure over the septic uterus will evoke pain, but we are now speaking of spontaneous pain. As systemic infection deepens and the various organs become affected this pain emanates from each in turn or is present in all. Thus we may have a complicating septic pleurisy with as sharp a pain over the affected lung as in case of pleurisy unassociated with septic infection. When the veins of the lower legs become thrombosed, giving rise to a phlebitis, the pain is of an acute type. Similarly, the pain associated with exudate in the pelvis is sharp and radiating. When the systemic infection is deep and associated with peritonitis of the purulent type, pain may be absent altogether, or, in case of rupture of an accumulation of pus into the peritoneal cavity, the pain may for a time disappear.

The intestinal tract sympathizes markedly with the systemic septic phenomena. Further, these phenomena are aggravated if the intestinal canal be not kept functionating. Such constipation may be the result of the septicæmia, particularly where the peritoneum is affected, when absolute paresis of the intestine frequently ensues. As a result, we have tympanites with the consequent pain in the abdomen and interference with respiration from pressure on the diaphragm. As the lesion of the peritoneum becomes more intense the intestinal coils cannot move, since they are firmly held by the bands of lymph or adhesions which are thrown out.

The upper digestive tract sympathizes, of course, as is shown by the coated tongue and the nausea and the vomiting. As the infection deepens the skin assumes the characteristic sallow hue and the exhaled breath has a sweetish odor. The woman lies in a species of typhoid condition from which it may be very difficult to rally her. Possibly, now, septic emboli are thrown off and metastases into the various organs of the body occur, giving rise to a pyæmia. Each embolus is apt to give rise to fresh constitutional disturbance, as evidenced by the repeated chills and alteration in the temperature-rate. In short, we are now dealing with nothing else than the pyæmia which occurs, independently of the puerperal condition, as the result of the infection of a wounded surface on any part of the body. It is the same story, only modified in so far as we are dealing with a puerperal woman.

As the systemic septic infection deepens the cerebral centres become affected, as is certified by the delirium, active or low in type. Concomitantly with the embolic deposits the various paraplegias and hemiplegias may develop. These affections of the brain and of the spinal cord may be temporary or remain permanent. Puerperal mania and puerperal insanity may develop and in course of time disappear or the intellect may remain affected.

In short, there is no organ and no system of the body which may not become affected by the sepic process, even as holds for septicæmia occurring aside from the puerperal state. If the woman ultimately recover it is rarely that she regains the normal in function. Some trace of an organic nature is apt to remain, be it in the nervous system, the kidneys, the heart, etc.

Such may be the clinical course of puerperal septicæmia, looked at from the broad stand-point of general systemic infection. We will now consider more in detail the separate local lesions, tracing as far as feasible the clinical picture offered by affection of one or another of the sexual organs and noting the treatment applicable in each case.

Clinically, we may differentiate the following septic diseases:—

Septic vulvitis and vaginitis.
Septic metritis and endometritis (including sapræmia).
Septic salpingitis and oöphoritis.
Septic peritonitis: (1) local; (2) general.
Septic thrombosis.
Pelvic cellulitis (including pelvic abscess).
Septic pyæmia.
Late puerperal infection.
Puerperal mania and insanity.
Puerperal tetanus.
Mastitis.

*Septic Vulvitis and Vaginitis.*—The vulva and the vagina, in particular the pelvic floor, are peculiarly liable to infection, since they are very accessible to contact. Rarely, further, is a labor terminated without the vulva being subject to a greater or less degree of contusion, and the pelvic floor, as a rule, suffers a certain amount of lesion, even though this be limited entirely to rupture of the fourchette. If the act of delivery has not been conducted aseptically, or if, during the puerperal state, care be not taken as regards asepsis, infection is likely to set in, and, in case of the development of local or general symptoms altering what we expect during the normal puerperal state, the vulva and the vagina should be the first locality to investigate.

Infection of the vulva, aside from sloughing and thrombosis, is very likely to spread to the glands of Bartholin. The infectious element gains access to the glands through the ducts, and this is followed by abscess. Possibly these glands may have been infected through a precedent gonorrhœa which has apparently been cured, but the latent virus has remained there, and the septic infection is characterized by a gonorrhœal complication.

Infection of the vagina may be direct at the wounded or abraded surface or it may be traced to the material used to suture a laceration. Improperly-sterilized catgut or silk will often be the starting-point of infection, and for this reason we prefer, for suture material in the emergency-surgery which lesion of the pelvic floor demands, a material, such as silk-worm gut, which may be readily rendered sterile through boiling for ten minutes.

Septic vaginitis may show itself by an increased secretion from the vagina, purulent in character and associated with a greater or a less degree of sloughing, or else we may find characteristics which, from their similarity in appearance, have been described as a diphtheria of the vagina. It is very questionable if we are dealing with a process similar to that which occurs in the throat, although clinically it makes no difference, since we have the same infiltration of the submucous tissues and the same constitutional infection. At times areas of the surface present a fiery red appearance, with radiating streaks, denoting lymphatic absorption. We have here the true puerperal ulcer, incorrectly called diphtheritic patches.

The appearance of the vagina in these cases of so-called diphtheria is, at the outset, that of a surface covered with grayish dots which cannot be removed readily; that is to say, we are dealing with an infiltration, and not with the mere formation of a membrane on the surface of the vagina. Later these small points coalesce, giving us the appearance of a dirty-grayish deposit on the vagina. On bacteriological examination it will be exceptional that the bacillus of Löffler, which is pathognomonic of diphtheria in the fauces, will be determined, and thus we may differentiate the condition from a true diphtheria. In principle it matters not, since the treatment will be identical.

As complications of septic infection of the vulva and of the vagina we often find extension to the urethra and the bladder or to the rectum, giving us a cystitis and a proctitis. A more common cause of this cystitis, however, is careless catheterization by touch instead of by sight, and without precedent disinfection of the introitus. The characters of these complications are simply like cystitis and proctitis occurring aside from the puerperal state as the result of infection. We have painful defecation and micturition, followed by the passage of pus from the bladder or the rectum. On inspection of the rectum or the bladder we will find the mucous membrane denuded and the site of an active inflammatory process. A complication of the cystitis may be a pyelitis, the symptomatology of which has been dwelt upon. The recurrent chills and the irregular excursions of temperature suggest pyemia. The examination of the urine clears the diagnosis.

Septic vulvitis is likely to be followed by infection of the inguinal glands, leading to suppuration and to abscess formation, or the veins of the thighs may become affected and puerperal venous thrombosis may occur in one or another thigh, giving us the so-called milk-leg.

If not checked in an early stage the infection from the vagina may extend to the cervix and thence to the endometrium.

Whilst a certain amount of constitutional disturbance is associated from the start with septic infection of the vulva or of the vagina, the chief symptoms are local. Thus, there is swelling of the vulva, with possibly induration of one or both of the glands of Bartholin, and the woman complains of a sense of burning and of heat in the vagina. The temperature may rise one or two degrees above the normal and the pulse-rate will always be accelerated, as is common to all affections which affect the general system. The woman further complains of pain on micturition, not necessarily because the bladder is affected, but since the urine flows over the posterior commissure, which is inflamed.

These symptoms simply become intensified as the inflammatory process progresses. In case of sloughing or the formation of the pseudodiphtheritic membrane the temperature may range over 103° F. and the pulse be accelerated in proportion, rising to 130.

It is obvious that early recognition and prompt treatment is requisite to prevent extension and sloughing, which latter might speedily lead to the formation of fistulæ into the bladder or into the rectum.

According to the intensity of the local lesion and the amount of lymphatic absorption, the constitutional disturbance will vary. Usually the secretion of milk will be arrested or become diminished. The lochial discharge will also sympathize with the constitutional disturbance, becoming arrested or diminished as the temperature rises or not. The lochia further will become fetid, but the source of the odor will be the sloughing and not decomposition in the uterine cavity, unless, indeed, the two processes are combined.

Since these lesions are the result of infection of wounds or abrasions of the vulva or pelvic floor, the symptoms will appear early or late, according to whether the infection enters during labor or at any time during the puerperal state, for as long as the wounds remain unhealed infection is possible.

The treatment of vulvitis is aseptic and expectant until evidence of suppuration offers. Aseptic cold compresses to the swollen labia will add much to the comfort of the woman, as well as in a measure modify the temperature rise. Abraded surfaces should be washed with a solution of bichloride 1 to 5000 a number of times daily, and dusted with iodoform, aristol, or bismuth, or, preferably, touched with the stick of nitrate of silver. Since, however, this yields only a superficial slough, pure carbolic acid or a 50-per-cent. solution of chloride of zinc is to be preferred. Alcohol limits the action of the former and bicarbonate of soda that of the latter. As soon as there is evidence of suppuration, under aseptic precautions incisions should be made, the various pockets being opened up, in order to avoid extension. In case one or both of the glands of Bartholin suppurate the incisions should be made into the gland along the inner surface of the labia; the abscess-wall should be curetted and cauterized with carbolic acid; tincture of iodine and carbolic acid, equal parts; or even the actual cautery may be used. The sac is then packed with aseptic gauze and thereafter treated as any abscess-cavity would be.

If the site of infection is a perineal wound which has been sutured, the stitches should at once be removed, the infected surface washed off with bichloride solution 1 to 5000, and then cauterized with nitrate-of-silver solution 60 grains to the ounce. We thus destroy whatever germs are active on the surface, and we form a wall of the albuminate of silver through which new infection will find it difficult to enter. After cauterization the surface may be dusted with iodoform or bismuth. A number of times daily the affected pelvic floor should be irrigated with bichloride solution 1 to 5000, or with 1-per-cent. creolin solution, and afterward dusted again with one or the other powder. Vaginal douching should be avoided so long as the lesion is localized at the introitus. The only effect of douching would be a possible infection of the upper vagina or the cervix.

Cystitis is to be treated according to the recognized methods apart from the puerperal state. The bladder should be irrigated every four hours with a saturated solution of boric acid, and diluents should be administered *pro re nata.* Urotropin in the dosage of 5 to 10 grains.

Of particular value is the use of the new silver synthetics—argyrol and protargol. They should be instilled into the bladder in a 25-per-cent. solution.

Proctitis is best treated by the local application of a solution of nitrate of silver 60 grains to the ounce. This application is, of course, to be made through a speculum.

So-called diphtheritic vaginitis calls for the same treatment, except that the measures at the outset should be more radical. The application of subsulphate of iron, which is strongly recommended, we do not favor, since the caustic effect is but slight and superficial and the resulting slough is very prone to decomposition. Cauterization with the chloride of zinc in 50-per-cent. solution is highly recommended, but we question if it be necessary to cauterize so deeply aside from the difficulty of limiting the action of the zinc. Where the process is just beginning the whitish patches may be touched to advantage with the actual cautery, or they may be scraped off with the curette and a solution of nitrate of silver, 60 grains to the ounce, may be applied. In case the infiltration has extended widely before it is discovered we believe that the best measure is thorough cauterization of the surface with the actual cautery. The surface is then kept powdered with iodoform or bismuth and carefully watched for the detection of evidence of spreading, when the same cautery should be used. In view of the favorable effects derived from resort to antitoxin in diphtheria of the fauces, in the event of the process in the vagina being true diphtheria—as evidenced by the finding of the Klebs-Loeffler bacillus—injection of the antitoxin suggests itself as a wise measure.

The treatment of local lymphatic extension will be referred to under the heading of "Septic Thrombosis," since the affection of the lymphatics is usually associated with that of the veins.

The constitutional treatment is self-suggestive. An abundance of liquid food—in particular, milk—should be given, and stimulants according to the condition of the pulse. It will do no harm to give 5 grains of the carbonate of ammonia every four hours as a routine measure, since the tendency of septic poisoning is to weaken the heart. Digitalis, strophanthus, and strychnin are valuable adjuvant cardiac tonics. Where the kidneys are insufficient, the infusion of digitalis, given by rectum, in 6-ounce doses every six hours, assists. In case the stomach is not tolerant the drug may be given in double the dose by the rectum. The bowels should be kept regular by laxatives and enemata, and opium should be avoided except when stringently called for, when codein should be tested in large dose—1 grain by the mouth and 2 by the rectum—before other alkaloid of opium is administered. The temperature rise need not be a source of anxiety. It is simply an evidence of the systemic infection, and it may be kept within limits by the application of an ice-bag. Antipyretics should be avoided,—in particular the coal-tar derivatives, which have such a weakening effect on the heart.

*Metritis and Endometritis.*—Whilst endometritis may exist and run its course without the concurrence of metritis, the presence of the latter necessitates the former. The etiological factors are extension infection from the lower genital tract, direct infection at the site of placental separation, contact infection by unclean hand or instrument introduced into the uterus, infection from a sapræmia, the result of the decomposition of clot or remnant of placenta or of membrane left in the uterine cavity.

It is essential to differentiate sharply the infection following on sapræmia from that which results apart from the latter, since the clinical signs are different, as also the demanded treatment.

Infection following sapræmia, or putrid infection, may be an early or a late phenomenon of the puerperal state. Ordinarily the symptoms manifest themselves about the third day, but in many instances nothing abnormal may be noted until a much later date, in certain cases not until the woman has been practically discharged from observation. Remnants of placenta and of membrane or clot (partially organized and partially attached) may remain in the uterine cavity for days without giving rise to local or constitutional symptoms, so long as these retained particles do not become infected. For this reason the symptomatology is of the most varied nature.

Ordinarily the course of events is as follows: About the third day we note increasing rapidity in the pulse-rate without elevation of temperature above 99° F. Chill may occur, but usually it is slight or absent altogether. It is more likely to be marked in instances where the lesion is of a sharp inflammatory nature from the start, instead of being characterized by a process of slow systemic poisoning, so to speak. The lochial discharge very shortly becomes altered. There is apt to be diminution in quantity and the color becomes darker and the consistency thicker. Gradual diminution or suppression of the lochia is only likely to set in at an early date, where there exists, as a complication, stenosis of the cervix with defective drainage. The odor of the lochia shortly alters; it becomes stale or of a most pronounced necrotic quality. On local examination the uterus is found to be larger than it should be at the stage of the puerperal period, and it is also softer on bimanual palpation. As the case progresses the endometritis merges into a metritis, and then we find a soft, boggy uterus, tender on pressure. Pain is apt to be absent until the tubes and the ovaries or the uterine covering of the peritoneum become affected, when, in addition, there is present a variable amount of tympanites, the evidence of paresis of the intestines, the result of the systemic infection. If the condition be overlooked or if the proper therapeutic measures are not resorted to, the general systemic infection progresses through lymphatic absorption and direct extension through the Fallopian tubes, and we note the development of peritonitis, local and general, with, at a still later period, thrombosis and embolism and pyæmia.

Should the endometritis be the consequence of contact infection without sapræmia, the symptomatology is different, and the physician, unless especially observant, is apt to be led astray. In these instances fœtor of the lochia is a late and not an early symptom. When it occurs it is due to the necrosis and the separation of the infected endometrium, and this process does not set in until

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ched. Tympanites develops early, because the intestinal tract
necessarily sympathizes with the systemic infection. Ultimately, if the process is not recognized early and treated after the recognized fashion, we note the development of all the characteristics of general systemic infection,—multiple thrombosis and embolism. Unfortunately, an endometritis developing apart from a sapræmia is not as amenable to treatment. It may be stated that sapræmia is one of the most frequent of puerperal deviations from the normal, and that, when recognized early and treated properly, it is most readily cured.

The clinical course portrayed above is by no means constant. Frequently, particularly in case of sapræmia, we shall note marked remission or even intermission in the symptoms. This occurrence is due to fresh systemic infection, either because the treatment applied has not been thorough or else because, during certain of the requisite manipulations, asepsis has not been complete. Thus, apparently, the woman is convalescing, the alarming symptoms having abated, when, of a sudden, there is renewed chill, rapid pulse-rate, and elevation of temperature. If this recurrence cannot be traced to recrudescence in the original local affection, then it is evidence of the extension of the process to the tubes or the peritoneum.

The treatment of these forms of endometritis differs markedly. It is very essential to differentiate them from the start. We are convinced that a great deal of harm has been done by resort to the curette in one of the forms, even as a great deal of harm has resulted from adherence to the douche in the cases where much more radical measures are demanded.

The first step is accurate diagnosis. The lower genital tract is carefully investigated by sight and by touch to exclude infection here. The interior of the uterus should then be investigated by the finger, for this is the only way to differentiate a beginning sapræmia from contact infection of the endometrium. In order to examine the interior of the uterus it may be requisite to administer an anæsthetic, but this should always be done where need be, since on careful differential diagnosis will depend the limiting of the infectious element or process at a time when extreme radical measures are not requisite. Anæsthesia by nitrous oxide is eminently feasible for this careful exploration of the interior of the uterus, and it is to be hoped that, before long, a fairly portable apparatus for administering this gas will be devised. Chloroform, as a rule, however, will answer, since the anæsthesia need rarely be prolonged. If the examining finger find the cervix wide open it is evidence that there is a foreign body in the organ, for such is usually the case, unless there exists stenosis at the level of the internal os. The body of the uterus is depressed by the external hand, and thus the examining finger may reach the fundus of the organ and examine the entire interior. In case clot or remnant of placenta or membrane be present the finger will recognize it, and it will also be able to form some idea of the extension of the infectious process beyond the point of attachment of the necrosing particles.

Frequently the finger may remove the putrid mass, and then, if the endometrium feel normal—that is to say, if it does not yield to the touch the sensation of a soft tissue on the point of breaking down—a douche of bichloride 1 to 5000 or of creolin 1 per cent. may be sufficient to cause the symptoms of putrid infection to abate. Rarely, however, will this be the case. As a rule, the infection has spread to the entire endometrium, and then a careful curetting, as is described in "Obstetric Surgery," is called for.

In the event of the examining finger determining a stenosis, with consequent retention of the infected lochia, thorough irrigation of the uterine cavity should be resorted to before the use of the curette is indicated.

In case the examining finger does not find anything in the uterus, then curetting is not called for until a later stage, when the necrosing endometrium begins to separate. Indeed, curetting in this condition will result in harm. The process may be as yet purely local on the surface of the endometrium, so to speak, and, if we curette, we simply open channels for fresh systemic absorption. It is in these instances that the repeated intra-uterine douche is indicated. This should always be administered by the physician, and creolin should be used instead of the bichloride, since a large quantity of the solution will be requisite at frequent intervals, and there is considerable danger of poisoning. It goes without saying that the manipulations should be characterized by the most absolute asepsis, otherwise the net result will be new infection. At the outset it is wise to wash out the uterus at least every three hours, unless the lochia becomes fetid, the index of necrosis, when the curette is called for. More recent views, shared by the majority of clinicians, teach that the curette should not be used and lay stress on the futility of repeated douching. The factor at fault is drainage. This may be secured and, at the same time, the germs on the surface or coming to the surface may be reached by resort to the following procedure: A large, thick, perforated rubber drain is carried to the fundus of the uterus and allowed to project from the vagina. It is surrounded by gauze wetted in a 60-per-cent. solution of alcohol. Every six hours 6 ounces of the alcohol is thrown into the uterus by means of a glass syringe, and, meantime, the toxæmia, or putrid infection, proceeds to become sterile, when such operative measures as may seem advisable are resorted to.

In putrid infection, after careful curetting, we believe it good practice to pack the uterus with gauze, not for the purpose of drainage, but in order to keep the abraded uterine walls apart. This gauze should not be left in longer than twenty-four to thirty-six hours, since at the end of this period there has inevitably collected a certain amount of detritus, the portion of the endometrium which has escaped the action of the curette, and this is simply retained by the gauze, which only allows the serum to escape. The gauze is therefore removed, the uterus is irrigated aseptically, and a fresh packing is inserted. Iodoform gauze is ordinarily recommended for this purpose, but we have become rather circumspect in its use, since we have often noted poisoning. In view of the fact that we possess in alcohol one of the most efficient germicides, it has been suggested that irrigation of the cavity with alcohol take the place of bichloride or creolin, etc. A sterile rubber tube is inserted into the organ and sterile gauze is packed around this tube. The tube is connected with a gravity syringe containing alcohol (95°), and thus the interior of the uterus is kept bathed, as it were, by the alcohol. The method is a complicated one, and Grandin prefers packing the uterus with gauze saturated with alcohol. This procedure has rendered him service repeatedly in the cases under consideration.

In all septic conditions it is requisite to keep up the bodily strength; therefore the administration of the carbonate of ammonia in 5-grain doses every three hours is indicated at the start. Other stimulants, such as whisky and brandy, we prefer to reserve for later stages of the process should we be unable to abort it early.

The prime reason for radical treatment of septic endometritis from the start is to prevent the extension of the infectious process to the tubes, ovaries, and peritoneum, when the remedial measures are necessarily of a much more radical type. This constitutes a further reason for supporting the system, as far as possible, by the administration of plenty of readily-assimilated food; so that, should the process extend further, the woman may be in as good a condition as possible to stand the operative measures which may be forced upon us.

Attention to the intestinal tract is, above all, called for, else the concurrence of absorption of fæcal products will obscure the diagnosis of the progress of the local affection. It is not sufficient to empty the bowels by enema, but every night, where requisite, a laxative should be given. A calomel purge is an excellent thing to start with, giving a half-dozen triturates, 1 grain each, one every hour, and then a saline should follow. Thereafter one or two compound cathartic pills at night will keep the intestines in order, particularly as the woman will be receiving liquid food, which is in most part absorbed.

Pain not being marked, it will rarely be necessary to administer an opiate, and this is fortunate, since we are exceedingly desirous of not paralyzing the intestines. An ice-bag applied over the abdomen, and kept on as long as the temperature ranges over 101° F., will quiet the slight amount of abdominal pain present as long as the infectious process remains local, and this will also spare tissue waste, which is associated with continuous high temperature.

An endometritis and a metritis may remain localized for weeks without extension to the tubes or the peritoneum. This fact is firmly established by clinical observers, and therefore it is well to sound a note of warning against accepting too readily a growing teaching, which is, that if the local process does not yield within short order, then, if we desire to avoid infection of the peritoneal cavity, with its concomitant great risk as regards the woman's life, the time has come when dallying with local measures should cease, and extirpation of the septic organ is indicated. We freely grant that this procedure is preferable to the gloomy outcome of attempts at curing general septic peritonitis, but the difficulty, as yet, is to decide what case is going to be cured by local treatment after the manner outlined and what case is going to pass into infection of the tubes and peritoneum. The physician who has been in a position to follow clinically such cases from an obstetrical stand-point, as well as the gynæcological, is less likely to err on the side of ultra-operative enthusiasm than he who has only witnessed septic endometritis and metritis and their sequelæ as a gynæcologist. We are satisfied that the vast majority of cases of septic endometritis will resolve under the modern treatment applied early, even though the course of the affection be a most protracted one, and therefore we counsel against the rash assumption that early hysterectomy is demanded. Where the infection is certainly progressing toward infection of the peritoneum, as becomes evident, usually, by the diminishing temperature rise and the increasing pulse-rate and the increasing tympanites unrelieved by the administration of laxatives and of enemata, where the symptom of abdominal pain becomes marked, then the time has come for hysterectomy, although, unfortunately, since this is an operation which calls for an expert, it will rarely be performed outside of large medical centres. And yet, when properly indicated, it is the operation which promises hope of saving a percentage of cases which will otherwise be lost. When performed, the vagina should be selected as the route, for reasons noted later on.

The technique consists in opening the anterior and the posterior *cul-de-sacs*, entering the peritoneal cavity, ligating or clamping the broad ligaments, removing the uterus and then the appendages. The details of the technique must be studied in treatises on gynæcology, although the operation should never be undertaken unless the physician is familiar with these details either from practice or from observation. This major operation has been performed repeatedly during the past few years, usually with failure; in a minority with success. Certain of the reported cases, however, strengthen us in our opinion that as yet we are unable to determine at an early-enough stage to be of benefit the instances where hysterectomy is stringently indicated. Thus, it is no credit to the operator and a discredit to the science to remove a uterus and to find in its cavity a portion of necrosing placenta which, had it been detected through digital examination and thereafter removed, would have rendered unnecessary the radical procedure. Indeed, there exists to-day in obstetrics no question of greater importance than the determination of when hysterectomy becomes indicated. It is a question which, sooner or later, the sober judgment of the many workers in the field will determine upon, and, meantime, it is well to protest against illegitimate operating of which a few—a very few—have been guilty.

When, notwithstanding all our care, the infection extends beyond the uterus, we note the development of septic infection of the tubes, the ovaries, and the peritoneum and cellular tissue. The symptomatology of these affections is often blended, and therefore we describe them clinically together.

*Peritonitis, Local and General; Pelvic Cellulitis; Salpingitis, and Oöphoritis.*—Although pelvic cellulitis unquestionably complicates the puerperal state independently of peritonitis, it is preferable to consider it as a subheading of the latter, in order to impress on the student the fact that, as a rule, it is an associate. This is what should be expected when we remember that the cellular tissue of the pelvic is either surrounded by the peritoneum or else is in intimate contact. It is established, however, that, whilst it is exceptional to see peritonitis without implication of the tubes or the ovaries, cellulitis may occur and suppurate, and the woman recover with intact appendages. In case of suspected suppuration, examination of the blood yields valuable information. Not alone is the leucocyte count to be sought, but also the polynuclear percentage. In case the latter exceeds 75 per cent., no matter how low the leucocyte count, the indication of the presence of pus is vouched for. High leucocyte count with low polynuclear percentage need cause us less anxiety.

The infection of the cellular tissue of the pelvis is through the lymphatics. Whilst, aside from infection, an exudate may be witnessed and may run the familiar course,—the so-called traumatic cellulitis,—cases of the kind must be looked upon with exceeding skepticism. The most common cause etiologically of puerperal cellulitis is infection from a laceration of the cervix. In such a case, about the third or the fourth day after delivery the woman may have a chill, although this may be so slight as to pass unnoticed. On local examination a bogginess of one or both lateral vaginal *cul-de-sacs* will be determined; that is to say, a sensation of fullness associated with evidence of congestion. The temperature rises often to 103° F. and the pulse is proportionately accelerated. These subjective symptoms continue from a few days to a week, when on local examination the vaginal *cul-de-sacs* will be found tense. Whilst the malaise of the patient has been exaggerated, in case there is no implication of the peritoneum or of the appendages there will not be present tympanites. In the event of the affection being traumatic the chances are that the high-grade symptoms will continue, gradually abating as the exudate is absorbed. On the other hand, if infection has occurred, after an interval varying from a week to two the *cul-de-sac* on the affected side will be found to soften and concomitantly the temperature is apt to drop, whilst the pulse-rate remains high. Such are the evidences of pus formation and of beginning systemic infection. We will find in such cases the development of what is termed pelvic abscess. The localization of the exudate which has broken down is extraperitoneal, and the indication is to incise the abscess-cavity *per vaginam* and to treat it aseptically. As a rule, the above symptomatology is much more obscure. It may be that there are signs of peritoneal infection, such as tympanites and pain extending over the abdomen instead of being localized over the side where the exudate is determined. In such an event it requires often the most expert touch and knowledge to determine whether peritoneal infection has occurred or not. Examination by the rectum will tell us, frequently, that the appendages are affected, there being evidence of marked congestion and, at times, enlargement. Again, we may note nothing special by the rectum except the exudate under or within the broad ligament. In this case it is advisable to order hot douches frequently repeated, and to meet the temperature rise by the ice-bag or, in case the rise is not over 102° F. and the abdominal pain is not especially marked, poultices. If, at the expiration of twenty-four to thirty-six hours, the tympanites increases and the local signs do not abate or offer evidence of local pus formation, the time has come for an exploratory abdominal section. Temporizing with a slowly-developing infectious peritonitis is out of the question. In every case where the evidence is strong that the tubes or the ovaries are affected by the septic process, early removal of the source of peritoneal infection offers the woman a chance of recovery. Otherwise, as will be noted, the chances are against her, no matter what the line of treatment resorted to.

Salpingitis and oöphoritis complicating the puerperium are the result of infection extending, as a rule, from the uterine cavity. Remembering the lymphatic distribution of the pelvic organs, infection of the tubes or the ovaries by these channels is perfectly possible, but such an occurrence is exceptional without coincident infection of the peritoneum. The tubes and ovaries may become affected, and, if the infection be not of a virulent type, then complicating peritonitis may not ensue, and, after a variable interval, the symptoms may abate, leaving the woman with diseased appendages. In these cases the symptoms are not apt to be marked. Pain over the affected region is present, but rarely of an acute type. The febrile disturbance is slight, as also the constitutional disturbance. On local examination congestion, varying in degree, will be noted at the outset in the broad ligaments, and, after subsidence of the acute stage, there will be determined more or less exudate around the appendages, with fixation, according to the amount of peritoneal and cellular implication. The treatment will consist in poultices in case the temperature rise does not exceed 102° F., or the ice-bag if the reverse hold true. Opiates should be withheld so as to be in a position to properly meet the peritonitis which may complicate. The bowels should be kept unloaded for a similar reason and also to obtain the derivative effect on the pelvic circulation.

In instances where the tubal and ovarian affection is of a higher grade, within a few days we shall obtain evidence of peritoneal infection, such as tympanites and diffuse abdominal pain. Even then the peritonitis may remain local, in which case the termination may be resolution of the acute process, with remaining disease of the appendages, or local abscess. In the latter event,—that is to say, if the symptoms instead of abating increase in severity, as shown by the increasing tympanites and abdominal pain, and locally by the bogginess in the region of one or both broad ligaments,—the course of action must depend on whether the pus points toward the vagina or above Poupart's ligament. As soon as pus formation is determined, or where there is strong ground for suspecting it, in case it is possible to evacuate it by incision in the vagina this site should be selected. If it be not possible to reach it here, then, after certifying the presence of pus by conjoined examination under anæsthesia, the wise course to pursue is to open the abdomen and to remove the appendages. This statement holds unless the diseased appendages are below the pelvic brim, when vaginal section is to be preferred to abdominal. In obscure cases, especially late in the puerperium, it is advisable, in any event, to examine through a vaginal incision, when frequently it will be possible to remove the appendages by this route and thus minimize the danger of general peritoneal infection. The general treatment is to avoid opium as far as feasible in order not to intensify the intestinal paresis, to administer laxatives so as to favor peristalsis and elimination as far as is possible by the intestinal canal, and, further, in order to limit, in a measure, the formation of intestinal adhesions. Nourishing food and stimulants *pro re nata* are obviously indicated.

Peritonitis may be the result of extension from the tubes through the fimbriated extremities or by direct rupture of accumulations of pus, or else it may result from infection through the lymphatics. Clinically, it is hardly feasible to differentiate the source of infection except in cases where the disease of the tubes has been watched for a variable period and there is superadded peritonitis.

Pre-existing pyosalpinx, or ovarian abscess, may rupture during the course of labor or at any time during the puerperal state and set up a peritonitis. In this event the peritonitis becomes simply an epiphenomenon of the puerperal state and cannot then be traced to puerperal infection. These cases are excessively rare, since women suffering from pyosalpinx or ovarian abscess, if the disease is bilateral, are not able to conceive. When the rupture occurs, however, the peritonitis is of the most virulent type, especially if the infection emanate from an abscess of the ovary. Speedy development of a peritonitis after delivery, as shown by the chill and tympanites, should always awaken the suspicion of the attendant. The subjective symptoms may not be marked. The chill is likely to occur, but there may be no marked elevation of temperature or much tympanites. The nerve-centres are, as it were, paralyzed by the infection; the facies may look pinched within a few hours, the pulse-rate may be high although the temperature is low, and the belly may be flat. In these cases there will usually be present a history of precedent pelvic disease to guide us in our diagnosis; but, whether there is or not, the treatment resorted to must be prompt, otherwise the woman is inevitably lost. Indeed, too often she dies, notwithstanding the promptest treatment. This treatment is abdominal section, the removal of the ruptured appendages, the flushing and cleansing of the peritoneal cavity as far as possible, and multiple drainage.

Similar remarks are pertinent to instances where a complicating appendicitis leads to peritonitis in the puerperal state.

Aside from these factors, peritonitis complicating the puerperal state must be traced to infection extending either by direct route from the uterus to the tubes or by the lymphatic supply.

Where the infection is slight and the lesion partakes more of the inflammatory type and less of the infectious, it would seem as though the clinical symptoms were different, although, at the present, this statement is made with reservation. Inflammatory excess is shown by the high-grade subjective phenomena. High temperature and gradually increasing tympanites unaccompanied by absolute paresis of the intestinal tract, even though the initial chill may be very severe and the gastric disturbance very marked, may lead the physician to suspect that he is dealing with an attack which is more benign as regards life. The treatment justifiable here is expectant. The ice-bag on the abdomen, maintained as long as the temperature remains above 102° F., will control excessive rise of temperature and, in a measure, quiet abdominal pain. In initial tympanites, often simply paretic, hyoscin hydrobromate, given hypodermatically in grain $^1/_{50}$ dosage, repeated hourly until the pupils are as large as saucers, should always be tested. The *rationale* of the method is the relaxation of spasm. Should the effect last longer than seems wise, we possess in morphia the physiological antidote. Further, in instances of this nature, the repeated instillation of small doses of a physiological salt solution is of great value. The well-known Fowler position, the head of the bed elevated, may assist on the ground that thus, perhaps, the exudates may become limited to the pelvis. Of course, this position can only be resorted to where the heart is strong. The woman should be fed by enema if the stomach is intolerant, and this may be continued for days if the rectum be frequently flushed with cold water. Attempts should be made to keep the bowel unloaded by enemata of ox-gall and saturated solution of Epsom salts; but it is useless to endeavor to administer laxatives by the mouth, owing to the intolerance of the stomach. Opium, if absolutely called for, should be given by suppository, codein being used in 2-grain doses, since it has less tendency to upset digestion or to limit peristalsis. In the event of the attack being mainly of an inflammatory type, the symptoms should abate at the end of a week. Locally, unless there be a complicating cellulitis, nothing may be determined. At the end of about a week possibly, on examination by the vagina, fluctuation may be detected, in which case the peritonitis has been localized, and vaginal incision and drainage of the pus collection is called for. In case the symptoms subside in intensity as regards the temperature rise and the tympanites, and yet the pulse remains relatively high and the facies become pinched, then the chances are that the peritonitis is of an infectious type, and, in order to give the woman a slim chance of life, abdominal section is called for.

Where the symptoms are not high-grade at the outset, or where they measurably increase as regards the evidence of general septic infection, as shown by the rapid pulse, out of proportion to the temperature rise, then surgical treatment is called for, although it must be confessed that, where the peritonitis is generalized, the woman's chance of life is very slender. The result obtained in the past through the administration of large doses of opium must have been in instances where the peritonitis partook of the inflammatory type with a minimum of the infectious element. The same statement holds for cases of recovery under the free administration of salines. Those who have opened women with general septic peritonitis and have seen the wide distribution of the pus, incapsulated under all the abdominal organs, will be loath to believe that either the free administration of opium or of saline can save these women. The fact is that general puerperal peritonitis, occurring from lymphatic infection, is simply an epiphenomenon of general systemic infection. On autopsy the veins and the lymphatics throughout the system will be found gorged with pus and infectious elements, and where the case has been protracted similar deposits will be found in every organ of the body. The women die from general septic infection and not from the peritonitis. Hence the urgency of either preventing the development of general septic peritonitis or of removing the source of infection early, where it can be traced to the tubes and the uterus.

Local peritonitis may run as high-grade a course as may general, often more so, and this obscures differentiation. If the symptoms of peritonitis tend to run a long course we may rest assured that we are dealing with a local process, and with a process where operative interference for the removal of the source of infection, usually the tubes or ovaries, will often result in the saving of the woman.

In instances of local peritonitis we may or we may not be able to palpate at an early stage the exudate which forms around the focus of infection and shuts off the general peritoneal cavity. The tympanitic distension of the abdomen may be as aggravated as in case of general peritonitis, and this will interfere with palpation.

On vaginal examination, however, as a rule, it will be possible to determine the lower boundary of the exudate in one or the other broad ligament. In this event, if the exudate approach the vault of the vagina, the proper course of procedure is to open the posterior *cul-de-sac*, enter the subperitoneal space, and evacuate the pus by the vaginal route and drain. This is not curative in that the probable source of infection is the tube, but the evacuation of the pus will enable the woman to emerge from the puerperal state and later, if need be, an operation may be undertaken for the removal of the diseased appendage or appendages. Not infrequently the pus attempts to point in the abdominal wall, above Poupart's ligament. In such an event the incision should be made parallel with this ligament, and when the abscess-cavity has been opened counter-drainage should, whenever feasible, be established into the vagina. Drainage is thus more perfect and convalescence is shortened. The systemic treatment applicable to these cases of local purulent peritonitis is to support the woman's vital powers through the administration of an abundance of easily-digested food associated with stimulants according to the demands of the heart. Febrile rise may be controlled by the application of an ice-bag over the abdomen, and here, as elsewhere when dealing with septic complications, the intestinal canal should be kept functionating.

General purulent peritonitis emanating from infection of the uterine cavity must receive the most speedy surgical treatment if we would hope to save the woman. In the event of a septic endometritis not yielding markedly within twenty-four to thirty-six hours of the application of the radical treatment we have elsewhere dwelt upon, the symptoms of peritoneal infection becoming marked, —that is to say, the tympanites becoming aggravated and the pulse-rate being elevated out of proportion to the temperature rise, which latter, we would again emphasize, may be only a degree above normal,—then recently-reported cases seem to prove that the time has come for operative interference of the most radical nature, in order to give the woman a slim chance of life. It has been certainly established that if the peritonitis became generalized the woman will die,

the treatment. We must forestall this generaliza-
ig at once the source of the systemic and the peri-
,—comprising the uterus, the tubes, and the ovaries.
to the skill of the operator, total extirpation may be re-
o by vagina or by the abdomen. The former is the route
is ted with the least systemic shock, but it is also the
whi fers to the inexperienced the greatest difficulties.
ever the route selected, we must remember that after total
n we have only succeeded in ridding the system of the source
i infection. We still have to deal with the infection which
ed the system before operative measures were resorted to, and
emands food and stimulants, attention to the function of the
tinal canal and of the kidneys. In cases of systemic sepsis the
organs require an abundance of water in order that they may
pt flushed and the system be thereby relieved of the waste
uct, which otherwise simply adds to the sepsis. The rôle played
urea and its derivatives in intensifying septic phenomena is of
great importance as that of the ptomaines absorbed from the intestinal canal. It is in cases of this character that the anti-streptococci serum has been utilized of late years, and the reports which have reached us have been of the most varied character. *A priori*, we should expect this serum to be alone of value in cases where the streptococcus is proved to be the infectious element, and yet careful study of the majority of recorded cases teaches that rarely has the observer taken the trouble to differentiate the causal factor of the infection; indeed, often the record would point to sapræmia as the cause of the disturbance, and this we know yields readily to the early treatment elsewhere described. As a rule, in the puerperal state we are dealing either with saprophytic infection or else with infection of the mixed type, and therefore antistreptococcic serum can hardly be expected to yield benefit. In streptococcic infection, on the other hand, the serum has fairly established itself as of value, and in doubtful cases it is not alone justifiable to use it, but it is incumbent on the operator so to do. Grandin has tested it in a number of instances, and from his experience the following rules for

administration are laid down: At the outset secure a reliable serum, inject 10 to 20 cubic centimetres at once, and note the effect. If the temperature falls, if the pulse-rate is lowered, the inference is that the serum is of value, in which event repeat in the dosage of 5 to 10 cubic centimetres every four hours. In cases observed by Grandin and others the subjective phenomena (from the side of the temperature and the pulse) are bettered and the secretion from the kidneys (and therefore the elimination of certain infectious elements) is greatly increased. Not infrequently chill follows on the injection of the serum, and at times nausea and cephalalgia, but these symptoms are not alarming. Up to the present the ground to assume in regard to the serum is that, whilst it may do good, it is not likely to harm, and that, the condition of the woman being most desperate, it is incumbent on us to use any and every remedy offering even a slender hope. In the metallic salts of silver (colargyrol and unguentum Credé) we possess agents of possible value. The Credé ointment is given by inunction; the colargyrol, by rectum in the dosage of 2 grains, or intravenously, in half the dosage, repeated every twelve hours.

Septic infection which takes on the chronic type is associated with thrombosis or offers the manifestations of pyæmia. Thrombosis is a late manifestation of the septic puerperium, and ordinarily shows itself in the veins of the lower extremities. We thus witness the development of what is popularly known as "milk-leg,"—a phlebitis and lymphangitis of one or both the lower extremities. Phlebitis and lymphangitis of this nature may either develop as a late manifestation of general sepsis or the puerperal state may have been on the surface uncomplicated, when, from the tenth day to the third week after delivery, the woman complains of dull pain in one or the other thigh, increasing in intensity and gradually associated with swelling and œdema. There may or may not occur a precedent chill; the temperature rise, however, is apt from the start to be high except in those instances where the complication sets in as a late manifestation of a protracted attack of systemic sepsis, when the phenomena are more apt to be low grade. This phlebitis runs a protracted course and subjects the woman to the risk of embolism of a fatal nature. The treatment consists in bandaging the affected extremity and administering an abundance of easily-digested food. Stimulants, such as the carbonate of ammonia, 20 to 30 grains in the twenty-four hours, should be given from the start. Counter-irritation by iodine over the course of the affected vessels is useful, in particular where the lymphatics markedly participate in the affection. Absolute rest in bed must be insisted upon.

Nowadays it is not often that we observe septic pyæmia. The reason doubtless is that the modern methods of treating sepsis in the puerperal state are more radical from the start, and such deep systemic infection as was formerly the custom rarely develops. The course of a septic pyæmia is exactly similar to that which is associated with wound infection apart from the puerperal state. Abscesses develop in remote parts of the body and in all the organs, and, whilst the course of the disease may be most protracted, the result is almost always death. The treatment at our disposal is purely nutrient and stimulant, meeting the complications as they develop; that is to say, opening the abscesses which become apparent on the surface. Possibly the antistreptococcic serum may benefit. In any event, its use is indicated.

*Late Puerperal Infection.*—Under this term are understood instances of infection which manifest themselves from the sixth day to even as late as the third week after delivery. The course of events is somewhat as follows: The woman passes through the early days of the puerperal state without any appreciable deviation from the normal. Of a sudden she has a chill or chilly sensations or else —and this is the most common course—the temperature shows an evening rise to 100° or 101° F. If the physician does not make the evening visit or if the nurse does not take the evening temperature this deviation from the normal may pass unnoticed. The woman loses her appetite and sense of well-being. If these symptoms occur at a period when there is still a lochial discharge this is arrested for an interval and then returns either profusely or else in diminished amount and with necrotic odor. There evidently has occurred arrest of involution, for on careful examination it will ordinarily be noticed that the uterus occupies a higher position than it is customary to find at the given date after delivery.

This symptomatology, although, as has been noticed, it is not exact or especially pathognomonic of any lesion, should awaken at once the anxiety of the attendant. Careful digital exploration of the pelvic organ is called for, since, to emphasize a point frequently dwelt upon, it is, above all, requisite in the puerperal state to meet local septic complications early, before they have an opportunity to become generalized. The chances are—and this may be stated as the rule—that the source of the infection is in the uterine cavity if the systemic symptoms cannot be traced to the mammary glands. It is exceptional for infection of the tubes or the ovaries to develop thus suddenly at a late period of the puerperal state. Examination of the interior of the uterus, if need be under anæsthetics, will usually reveal a portion of the placenta or a piece of membrane which is necrosing. In the event of there being present in the uterus a foreign body such as the above, the organ is not only larger than it should be, but the cervical canal is open, and it is a comparatively simple matter to remove the necrosing remnant by the finger, which is preferable to the curette, since thus we may not alone be certain that we are removing the entire portion, but we may also satisfy ourselves of the condition of the endometrium. If this be necrosed through extension from the infectious remnant, then it will be necessary to curette the diseased endometrium; otherwise it suffices to remove the remnant, to wash out the cavity of the uterus with bichloride 1 to 5000, and then, for a period of twenty-four hours, to pack with sterile gauze saturated with alcohol (95 per cent.). At the end of this time the gauze should be removed under absolute aseptic precautions, and if the systemic signs of infection have abated we need do nothing more. In case, however, there is still a necrotic odor or if the uterus does not show a tendency to contract,—that is to say, to involute,—then it is wise to repack, watching for symptoms suggestive of spreading of the infection, which is not unlikely to occur. Extension to the tubes and ovaries or the peritoneal cavity, whilst uncommon at a late period of the puerperium, where the symptoms of beginning infection of the uterine cavity are recognized early and properly treated, may yet occur, and in this event the treatment dwelt upon is called for.

In chronic pyemic states, it has been recommended of late years that we proceed to excise the thrombosed veins. The operation is most difficult and but few successes have been reported. It is an operation to be taken into serious consideration, although it is only applicable to those veins which can be reached, such as the uterine and the spermatics. We must never forget, when estimating the value of such a suggestion that probably all the venous trunks in the body are similarly implicated, and to attempt to extirpate these results in extirpation of the woman, so to speak.

*Puerperal Mania and Insanity.*—In women not predisposed to these complications their occurrence must be looked upon as evidence of septic infection. In this latter class of cases the manifestations occur late in the puerperal state, either concurrently with other evidence of infection or else suddenly. Women who have passed through pregnancy in a melancholy state are apt to develop acute mania during the early puerperium, or, at any rate, at some time during early lactation. Women whose constitutions are undermined by an intercurrent attack of an acute affection during pregnancy, or women who are the sufferers from one or another chronic disease, are also apt to develop mania during the puerperal state. Especially is this so if such women are allowed to endeavor to nurse the infant. The system cannot stand the extra strain of lactation, as it were, and the evident corollary is that such women should not be allowed to attempt to nurse.

Mania of an acute type runs the course customary aside from the puerperal state. The temperature is elevated, often to an exaggerated degree, and delirium or hallucinations are common accompaniments, varying in grade according to the systemic disturbance. Careful local examination should be made in order to exclude local sepsis in the pelvic organs as the source of the abnormal symptoms. The temperature rise may be controlled, in a measure, by the application of an ice-bag and ice-cap; absolute quietude of surroundings is advisable; bromides may quiet the mental disturbance, although hyoscyamine in large dose, frequently repeated, answers better. Where the woman refuses food, as she often will, rectal feeding is necessary. Stimulants should be avoided, since they intensify the cerebral congestion which is likely to be present. The course of the mania is apt to be very protracted, even in cases where the tendency is toward cure and not toward permanent insanity. Such patients do far better if they can be removed from home, apart from the anxious solicitude of relatives and friends, for frequently a marked hysterical type associates the mania, and this is fed by oversolicitude.

Mania of a less acute type requires the most careful watching. The woman is very apt to take a sudden dislike to her child, and may destroy it. She is likely, also, to injure herself. Chronic mania passes insensibly often into permanent insanity. It is well from the start to place the woman in an asylum where she may have the care and the oversight so difficult to obtain at home. Aside from this, the woman's condition will frequently alter for the better when she has been removed from her home surroundings, to which, often, she has taken an intense dislike. The treatment of the chronic type of mania is through hyoscyamine in large doses, the administration of an abundance of readily-assimilated food, and the securing of quiet. Obviously, lactation should not be countenanced.

*Puerperal Tetanus.*—This excessively rare complication of the puerperal state finds its etiological cause in wound infection, even as do all the manifestations of sepsis in the puerperal state. Hardly one hundred instances have been recorded, and the mortality-rate in these approximates 90 per cent. It is seen after abortion as well as after labor at full term, and, whatever the treatment employed, the course is apt to be toward fatal result. Superadded to manifestations of septic infection we see stiffness of groups of muscles develop, associated with tonic spasms. Aside from the treatment demanded by the septic manifestation, of which it is a complication, we can do little. The changes have been rung on the

and opiates, but without result from a curative
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ectum will palliate the chief symptoms. The results
m resort to serum-therapy apart from the puerperal state
its use here, and perhaps thus the excessive mortality-rate
lowered. The anti-tetanic serum, injected into the spinal
has latterly been strongly commended; its use must be per-
in, on the ground that it cannot harm.

*sonins.*—We question if the opsonic theory is at the present
ntly developed to allow of definite statement in face of the
ral infections. The vaccinations to be at all effective in the
eral state must consist of mixed vaccines since rarely do we
ith pure infections. The future, however, may cause us to
re optimistic.

*Puerperal Hæmatomata.*—Hæmatomata form in the vulva, in
vagina, or in the broad ligaments. They are characterized by
ptoms of hæmorrhage with the attendant anæmia, varying
ccording to the amount of blood lost or rather effused. The local
tumefaction appears at the site of the effusion. If they form during labor they may be so extensive as to interfere with normal delivery. The primary indication is to deliver as quickly as possible and then to resort to remedial measures. Those which form as the result of lesion of the cervix—deep laceration, extend into the broad ligaments. Sometimes they rupture into the retroperitoneal space, and may dissect upwards towards the region of the kidneys. The simple vulvar and vaginal varieties are to be treated by the application of ice, and thus, as a rule, they become absorbed. In the event of suppuration they are to be cleaned out along surgical rules, the cavity mopped out with pure carbolic acid, and next tamponed with alcohol gauze. In the extensive dissecting varieties, shot-bags applied over the abdomen may limit the bleeding. Fortunately, as a rule, the hæmorrhage is limited by the extent of the cellular tissue in the region affected. When evidence of suppuration appears, surgical rules become applicable. In desperate instances a hysterectomy might be indicated.

*Mastitis.*—Again, we note that wound infection is the source of mastitis. The infection occurs at the nipple and thence is carried by the lacteal ducts into the gland, to be drunk up by the lymphatics and disseminated throughout the system. Hence the reason why, during pregnancy and the puerperal state, the greatest cleanliness of the nipple is requisite, as well as the avoidance of applications the tendency of which is toward the destruction of the protecting layer of epithelium. Further, cleanliness of the child's mouth is requisite as well as of the hands of the nurse before she touches the breasts. A not uncommon cause of infection is the woman herself, who touches an abraded nipple with unclean hands.

Cracks in the nipple should be kept aseptic by washing with boric acid in saturated solution, and the cracks should be touched with lunar caustic, thus forming the albuminate of silver and erecting, as it were, a barrier against the entrance of infectious elements. The infant should not be applied directly to a breast the nipples of which are cracked, but a rubber nipple-shield, rendered aseptic by boiling and soaking in a saturated solution of boric acid, should be the intermediary.

The development of a mastitis shows itself frequently by slight chill or only by febrile disturbance, which cannot be explained from the side of the pelvic organs. As a rule, a mastitis develops within the first ten days following the delivery, although infection of the nipple may occur at any time during lactation. We distinguish a glandular and a subglandular form of the affection. As is noted in "Obstetric Surgery," it is essential to differentiate these forms as early as is possible, since the subglandular form may do extensive damage before the local evidence of inflammation offers. The cardinal signs of inflammation characterize the glandular form; that is to say, heat, redness, and swelling of the affected gland. As soon as induration is detected in the gland nursing should be interdicted, although engorgement of the mamma must be prevented by emptying the breast at regular intervals by the hand. Of course, the child may be nursed on the unaffected side, even though this tends to congest the affected side. The application of the child to the unaffected breast at rather infrequent intervals, however, does less harm to the woman than absolute interdiction of nursing may do the child. An ice-bag applied over the site of the induration may abort it before pus formation, and in this septic complication, as in all others, the derivative effect of purging should be resorted to. Diminution in the amount of liquid ingesta allowed the woman will do much toward preventing the accumulation of milk in the gland, although it must be remembered that we thus also diminish the total secretion of milk. Just as soon as there is evidence of pus formation this should be evacuated, as is stated in "Obstetric Surgery."

The submammary form of mastitis in the vast majority of cases will make rapid strides before diagnosis is sufficiently certified to warrant incision. The pus travels everywhere under the mamma, dissecting it off the pectoral muscle, and in unrecognized cases the pus may perforate into the pleura. Usually the local symptom of pain in the affected breast will justify exploration in the absence of evidence of possible source of the symptoms elsewhere. Aspiration under aseptic precautions with a large needle—for the pus is frequently thick—may reveal the presence of pus, in which case free incision, with multiple drainage where necessary, is the treatment. This treatment is exemplified in "Obstetric Surgery."

These surgical methods may to-day be replaced by the Bier hyperæmic method. Its rationale depends on causing intense hyperæmia in the inflamed breasts and this is followed by an intense anæmia with enormous absorptive power. It is an imitation of the old and valued cupping method but it possesses great advantages. The apparatus consists of a large bell jar which is applied over the breast and then the air is exhausted. There results intense hyperæmia. The parts become cyanotic, and a little blood may appear at the edges, but this is immaterial. The suction is continued until the woman complains of pain when the apparatus is removed. As a rule, application for about five minutes suffices. The procedure is repeated two to three times daily, although, in mild instances, once is sufficient. Ordinarily, the pain subsides after the first application. The breast is then covered with a solution of alum-acetate, or an alcohol compress. Even though pus be present rarely are surgical measures called for. The cure may require two weeks but incisions are avoided, or little more than a stab wound. Thus we dispense with unsightly scars and a functionally ruined breast.

# PART IV.—Obstetric Surgery.

OBSTETRIC ASEPSIS, ANTISEPSIS AND ANÆSTHESIA.
OBSTETRIC DYSTOCIA AND ITS DETERMINATION.
ARTIFICIAL ABORTION AND THE INDUCTION OF PREMATURE LABOR.
FORCEPS.
VERSION.
SYMPHYSIOTOMY, AND PUBIOTOMY.
ABDOMINAL AND VAGINAL CÆSAREAN SECTION. THE DUHRSSEN OPERATION.
EMBRYOTOMY.
THE SURGERY OF THE PUERPERIUM.
ECTOPIC GESTATION.

# CHAPTER XI.

## OBSTETRIC ASEPSIS, ANTISEPSIS AND ANÆSTHESIA.

It is only within recent times that obstetric surgery has progressed toward the scientific eminence to which it may justly lay claim to-day. Before the advent of the era of antisepsis and asepsis, before the fear of handling the uterus had been swept away, the forceps and version were the only operations which came within the ken of the average practitioner, and the results from resort to these were anything than matters to be proud of. So-called childbed fever was virulent not alone after spontaneous labor at term, but also after resort to any and all obstetric operations.

To-day the scene has radically changed. Septicæmia after labor is justly considered as due, in almost every instance, to faulty asepsis; gradually bettering attempts are being made to educate the student with a practical knowledge of the entire range of obstetric surgery, and extra stress is being laid, as it should be, on the absolute necessity of studying the pelvis of the pregnant woman before the advent of labor, so as to be in a position to take advantage of that operative procedure, where any is indicated, which is best not alone for the woman, but which also takes into account the welfare of the child. Whilst, then, more accurate educational methods enter as factors in the science of obstetrics as practiced to-day, the fundamental reason why the mortality-rate has been lowered is the recognition of the culpability of the man who neglects the laws of cleanliness (asepsis and antisepsis) throughout the conduct of labor and during the puerperal state. Lack of cleanliness (asepsis and antisepsis) will ruin the most expert technique, and, therefore, a thorough grounding in the fundamental laws of cleanliness as applied to obstetric work is essential to the undertaking of the surgery of the art.

Antisepsis is simply the means of certifying to asepsis (cleanliness). The whole question has been needlessly complicated by the introduction of scores of chemical agents which possess, to a greater or less degree, the power of rendering inert the micro-organisms which exist in, or may be conveyed to, the human body. It is possible to secure asepsis without resorting to antisepsis, but, in order to surround surgery with every possible safeguard, these chemical agents must be looked upon as absolutely essential. The point to be remembered in obstetric surgery is that too free indulgence in antisepsis may do harm even whilst it aims at good. The nature of many of the antiseptic agents on which we must needs rely is poisonous to the human body. Therefore the corollary must be borne in mind that overzealousness in matters of antisepsis may injure and kill, even as lack of asepsis may be followed by similar effects. Obstetric asepsis is secured through attention to (*a*) the person of the accoucheur, the nurse, and assistants; (*b*) the lying-in woman; (*c*) the instruments and accessories.

### (*a*) ASEPSIS OF THE ACCOUCHEUR AND ATTENDANTS.

It being absolutely proven that septicæmia is heterogenetic,—that is to say, does not originate within the body,—it is the bounden duty of all who come in direct contact with the lying-in woman to keep themselves not alone clean, but also free from those acute infectious elements which, through inoculation, breed sepsis. The ideal obstetrician, like the ideal surgeon, should avoid seeing patients suffering from certain of the acute infectious diseases, such as scarlet fever and diphtheria; and, except in absolute emergency, should have nothing to do with post-mortem examinations. These rules of conduct should be absolute with the expert obstetrician, who, from recognized standing, is liable at any time to be called upon to give advice in the minor emergencies of labor or to act as chief in major operative obstetrics. Barring spontaneous or operative traumatic lesions, the risk the lying-in woman runs is septic infection at the hands of her immediate attendants. The general practitioner of necessity must perform obstetric work even whilst his routine duty calls for attendance on scarlet fever, for instance. The greater, therefore, the precautions he should take to bathe thoroughly, to change his garments, to wash his hair and beard, to asepticize his hands before going from such diseased states to a woman who is about to perform a physiological act. In the event of his time being occupied to a great degree with attention to patients sick from any of the acute infectious diseases, so that he finds it difficult to take the simple and yet most essential precautions mentioned above, then it is wise, to say no more, for the time being to refuse to attend labor cases, else, as has too frequently happened, one puerpera after another will be diseased, if not killed. The man who makes post-mortems frequently is a death-dealing obstetrician, and the careless general practitioner may become such. It has been well said, and cannot be emphasized too strongly, that puerperal sepsis means faulty technique,—that is to say, one or more attendant is to blame. There is no shifting the responsibility on nature.

Such general measures as have been noted apply with even greater force to the nurse. She will come more frequently in contact with the woman, and, if careless, is even more likely to infect. If ignorant, as outside of large centres she is apt to be, she may even now, in this aseptic age, fill grave-yards as she did in the past. It becomes, therefore, the duty of the physician to investigate the previous occupation and whereabouts of the nurse his patient has engaged, and to insist on her practicing the most rigorous antisepsis as regards her clothing and person. Asepsis is not sufficient for the average nurse; she must be provided with antiseptics in order to cause her to approximate cleanliness. It goes without saying that she should never be allowed to attend the lying-in woman if she has been, within at least a week, in attendance on one of the acute infectious diseases. The rigid rules about to be noted as applicable to the care of the obstetric hands are to be enforced with her even as they must be with the physician.

In the lying-in room the physician should remove his coat and roll up his shirt-sleeves above the elbow. Since, aside from instruments, the hands are most likely to infect the woman from direct contact, great care must be exercised to render them aseptic. If the physician has recently been in contact with any infectious material, thorough washing in soap and water and scrubbing in bichloride solution will not suffice to render these hands aseptic. Under such conditions the following method must be resorted to: The hands and arms are scrubbed for at least ten minutes in hot soap and water, the latter being frequently changed. Especial attention must be paid to the finger-nails, under which the infectious elements are most prone to lodge. The hands and the arms are next covered with a hot saturated solution of permanganate of potash, and are then immersed in a hot saturated solution of oxalic acid until the stain of the permanganate has entirely disappeared. The oxalic acid is next removed by soaking the hands in hot sterilized water. An equally efficient method and less troublesome in private practice is to substitute chlorinated soda for the permanganate and oxalic acid and afterward to immerse the hands for five minutes in 60 per cent. alcohol.

As an extra precaution the physician should wear rubber gloves. The nurse should always be compelled to wear them. After such preparation of the hands bacteriological tests have proven them absolutely aseptic, the gloves simply certify more exactly. Under ordinary conditions, that is to say if the physician has not handled pus, the permanganate and oxalic treatment is unnecessary. It suffices to scrub the hands for ten minutes in hot soap suds, then immerse them in 60-per-cent. alcohol for five minutes, and next in 1 to 2000 solution of bichloride. It is to be noted that 60-per-cent. alcohol is a greater germ-killer than 95-per-cent.

Before proceeding to the performance of any obstetric manipulation, the physician should cover his clothing with a clean sheet, which may be found in even the households of the most indigent.

### (b) ASEPSIS OF THE LYING-IN WOMAN.

Thorough asepsis of the genital tract of the woman is most essential, and, at the same time, most difficult to secure. These organs must be rendered surgically clean, and yet the means resorted to must be such as will not injure the protecting coat of epithelium. It is very questionable if douching of the genitals is sufficient for asepsis. The antiseptic agents thus employed at best only come in contact with the superficies. The external genitals must be scrubbed with hot soap suds, next with 60-per-cent. alcohol and finally with 1 to 2000 bichloride solution. As regards the vagina, we have shown that it is normally sterile, owing to the presence of the Doederlein bacillus—the lactic acid bacillus, and therefore it should never be scrubbed unless there be present pus or sloughing.

In the event of the proposed operation being abdominal, such as a Cæsarean or pubiotomy, the abdomen must be prepared by scrubbing with hot soap suds, next with 60-per-cent. alcohol and finally with 1 to 2000 bichloride solution.

### (c) ASEPSIS OF INSTRUMENTS AND ACCESSORIES.

The elaborate processes which are in use in hospitals obviously cannot be resorted to in private practice. Just as thorough asepsis, however, as regards instruments, may be secured if these have been carefully cleansed by the physician before they are taken to the woman's house. Instruments which have been scrubbed with soap and water, and next boiled for ten minutes in a 1-per-cent. solution of carbonate of soda (the common washing-soda), may be deemed aseptic. This asepticism, however, is destroyed if they are then placed in the average obstetric bag, which contains bottles and cotton, and, from old age, micro-organisms of every possible genus.

The sterilized instruments must be wrapped in a sterilized napkin or towel before they are placed in the bag, and immediately before use must be again washed in hot soap-suds and next boiled in the 1-per-cent. soda solution. In every household the washing-soda will be found, as well as the pot in which to boil them. The instruments may be used directly from this soda solution or else may be first transferred, with aseptic hands, into a 5-per-cent. solution of creolin,—a solution which is an efficient antiseptic and yet will not injure the instruments as does bichloride. This creolin further answers the purpose of an emollient. If there is one thing more dangerous to the patient than another, it is the vaselin which it is customary to use as an emollient. The vaselin-pot should, once and for all, be banished from the lying-in chamber. If newly-opened it may not contain micro-organisms, but when it has been repeatedly exposed to the air, and possibly has been used scores of times, it will be found a veritable culture-medium for bacteria. Creolin will answer as a lubricant for the finger and for the instruments, and this should be the only lubricant allowed in the lying-in room, unless the physician prefers to use sterilized oil.

As far as is possible the physician should avoid using rubber instruments. It is difficult to render them sterile. The stronger antiseptics will ruin them, the weaker will not asepticize them. Prolonged boiling may sterilize them, but often at the expense of their integrity and, therefore, of their utility. Glass catheters and glass irrigating-tubes should be selected. These may be boiled, and are thereby rendered safe to use. The metal catheter, which the average nurse will produce with much pride, should be taken away from her and returned only when she leaves the case, and then with the injunction to either throw it away or to lock it up and forget it. Many a case of puerperal cystitis has been traced to the use of this relic of preaseptic days.

During the performance of an obstetric operation sponges should not be used. This is another article which should have no foot-hold in the modern lying-in room. Sterilized towels and sterilized gauze or absorbent cotton should take the place of the sponge. In every household, no matter how humble, there is an oven, and in this towels and gauze may be baked. If the oven is lacking, there always exists a means for boiling them.

For purposes of irrigation normal salt solution or boiled water should be used. Lysol, in ½-per-cent. solution, may be added to the boiled water since it makes an excellent lubricant.

Ligature and suture material must be absolutely sterile. For internal suturing, catgut, chromicized, is the best, provided it be bought in tubes so as to avoid the temptation of saving the remnants as may happen when taken out of a bottle. For external suturing, silk-worm gut, boiled for ten minutes, answers admirably. Silk finds no place in the outfit of the general practitioner. Obstetric surgery, being ofttimes emergency surgery, the operator frequently has not the time requisite to prepare silk so as to absolutely certify to it. Further, since the major part of obstetrics falls to the lot of the busy general practitioner, obviously, his precedent preparations must be as simple as is consistent with absolute asepticism.

If these simple rules for securing asepsis of the lying-in woman and her surroundings are followed, the morbidity-rate and mortality-rate in private practice will approximate those which are secured to-day in maternity hospitals, where the mortality-rate has been reduced to a fractional percentage, and where morbidity from sepsis is practically abolished. We have endeavored to emphasize our belief, and this is the current belief, that the lying-in woman is infected solely through personal contact. By this we mean that the atmosphere is not a factor, and that the infectious material does not originate in the body of the woman. The sole exception to this latter statement is where, during the progress of labor or during obstetric manipulation, a pyosalpinx, for instance, ruptures. Such an event may lead to septic infection of the woman, but then the sepsis cannot be properly considered an obstetric epiphenomenon.

*Aseptic* and *elective* obstetrics rob labor of its terrors and the puerperal state of well-nigh its sole risk.

### ANÆSTHESIA AND ANÆSTHETICS.

In obstetrics, anæsthesia is usually given intermittently. To the surgical degree it is only called for wl [illegible] f a protracted nature is essential. The best agent is chloroform. It is to be remembered that the risks ordinarily carried by this agent do not hold in obstetrics. The contractions of the uterus are constantly sending the blood to the brain and the tendency to anæmia and cardiac failure does not exist. Except where the operation is one of long duration, the anæsthesia is only given during the contractions of the uterus, with the end in view of "taking the edge" off the pain, so to speak. Only when the head is beginning to crown is surgical anæsthesia called for and this is of short duration. In emergency work, the woman may administer the chloroform to herself, although, whenever possible, an assistant should give it. In country practice this is usually an impossibility. An ordinary goblet, carrying a handkerchief, the edges of the goblet being lubricated, to prevent an excess of chloroform from burning the lips, is handed to the woman, after about one drachm of choloroform has been poured upon the handkerchief, and she is told to inhale during the contractions. Should she take more than the transient inhalation required, the goblet at once rolls on to the bed. Under no circumstances should the woman be given a mask or a handkerchief for this will fall over her mouth and the woman may receive more of the chloroform than she ought to have.

For protracted anæsthesia, whenever a skilled assistant is obtainable, we are still in favor of chloroform, although we grant a slightly increased risk over ether. On the other hand, it is to be remembered that ether tends to check the secretion from the kidneys and a smooth puerperium requires that these organs should functionate normally. In the presence of toxæmia, ether is absolutely contra-indicated.

Nitrous oxid and ethyl-chlorid are very transient in effect, rarely at hand when needed, and they do not relax spasm to the degree obtainable from chloroform or ether.

Of late, attempts have been made to popularize scopolamin-morphin anæsthesia. We deprecate this on the ground that, in obstetrics, morphia should always be avoided where at all possible since it locks the secretions from the intestinal tract, and a smooth puerperium requires that this should functionate normally, and, further, reports from certain clinics in Europe prove that this combination is not without danger to the woman as also to the child. Thus, from one of the clinics at Florence, Bertino analyzes four hundred cases where this combination was used. He finds that, apart from a proportion of failures, in about 40-per-cent. the uterine contractions were reduced in intensity or rendered invalid, and that, frequently, during the second stage the contractions of the abdominal muscles were interfered with. As regards surgical anæsthesia, this was rarely secured. As a rule, the fœtus was badly affected. After birth the respiratory centre was often torpid, a protracted period of apnœa supervening; the desire to sleep with shallow respirations was fairly constant. A proportion of the children were born asphyctic. The death of one child he attributes directly to the combination. During the puerperium, he noticed visual disturbances—such as extreme mydriasis and mental disturbances—such as hallucinations and delirium, and in four cases protracted vomiting.

Such data satisfy us, that, notwithstanding the enthusiasm of a few American obstetricians, scopolamin-morphin anæsthesia should find no place.

# CHAPTER XII.

## OBSTETRIC DYSTOCIA AND ITS DETERMINATION.

A SCIENTIFIC knowledge of the configuration of the female pelvis and of the methods of estimating its capacity is an essential prelude to the practice of midwifery. The surgical side of the art, in particular, rests its results on accurate pelvimetry. The fate of the woman and of the fœtus is intimately linked with the expertness of the physician in determining, before or at the time of labor, the probable capacity of the pelvis in its relation to the estimated size of the fœtus. A consideration, therefore, of the surgical means at our disposal for assisting labor or for facing its emergencies, must be preceded by a careful study of the pelvis, normal and abnormal.

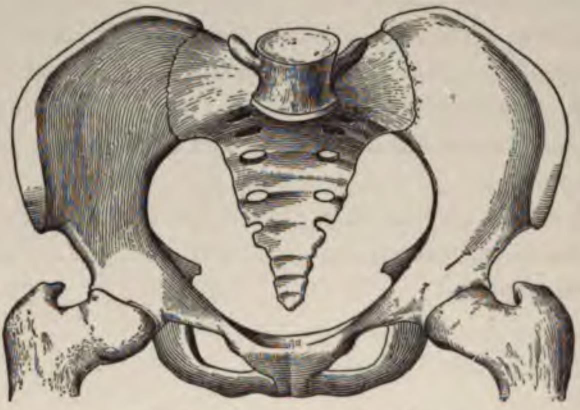


Fig. 22.—Normal female pelvis.

Furthermore, the pelvis is not the only element in the problem which is to be solved. An approximate idea of the size of the fœtus which is to pass through the birth-canal is also to be secured. It is essential, therefore, to precede the surgery of parturition by a description in brief of the anatomy of the obstetric pelvis and of the general physical features of the fœtus.

The pelvis is formed by the union of the ossa innominata with the sacrum. The sacrum is connected with the vertebral column above and with the coccyx below. The resulting canal is larger above than below, and is flattened to a degree from in front backward. The superior, wider portion constitutes the greater pelvis, the inferior and narrower portion the lesser pelvis. The pelvis is further subdivided into a number of straits, the entrance into the canal receiving the name of superior strait, the median portion constituting the middle strait, the exit from the canal the inferior strait. It is the determination of the measurements in various directions of these three portions which is termed pelvimetry, and the

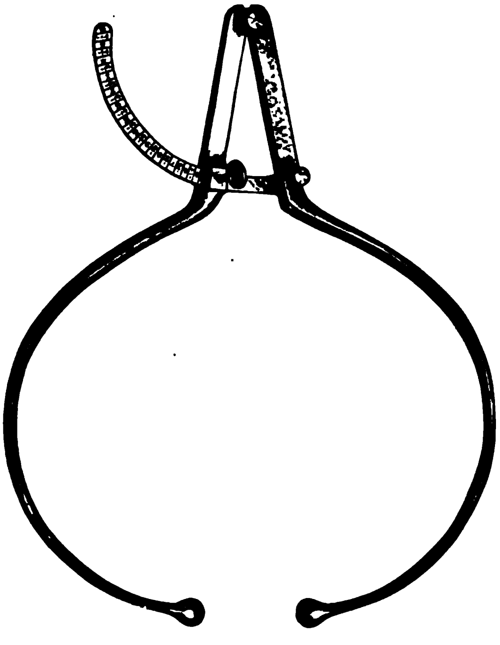


Fig. 23.—Baudelocque's pelvimeter.

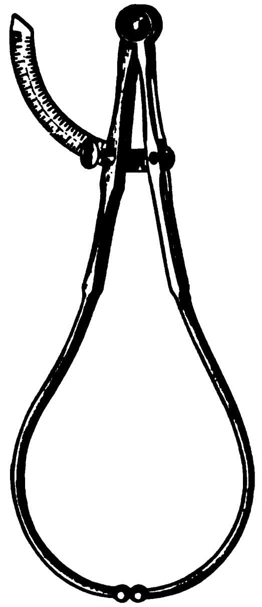


Fig. 24.—Martin's pelvimeter.

resultants constitute the diameters of the pelvis. The diameters of the pelvis are to be obtained both externally and internally, and the former stand in a certain relation to the latter.

### INSTRUMENTS FOR THE DETERMINATION OF THE PELVIC DIAMETERS.

The best-known pelvimeter is that devised by Baudelocque. In view of the fact, however, that the instrument should be portable, the Martin pelvimeter or that of Collyer will be found preferable. It should ever be remembered that the pelvimeter is as indispensable to the obstetrician as is the microscope to the physiologist, and, therefore, that it should be associated with pregnancy in his mind as the forceps is with labor. (Figs. 23, 24, 25, and 26.)

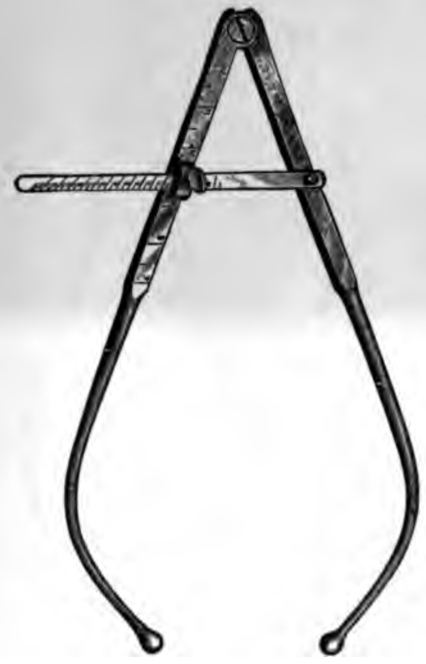


**Fig. 25.—Schultze's pelvimeter.**

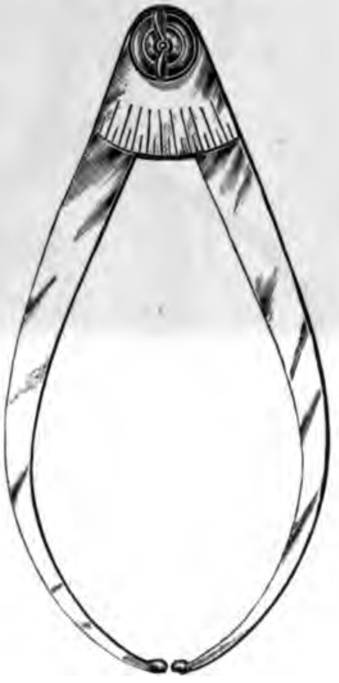
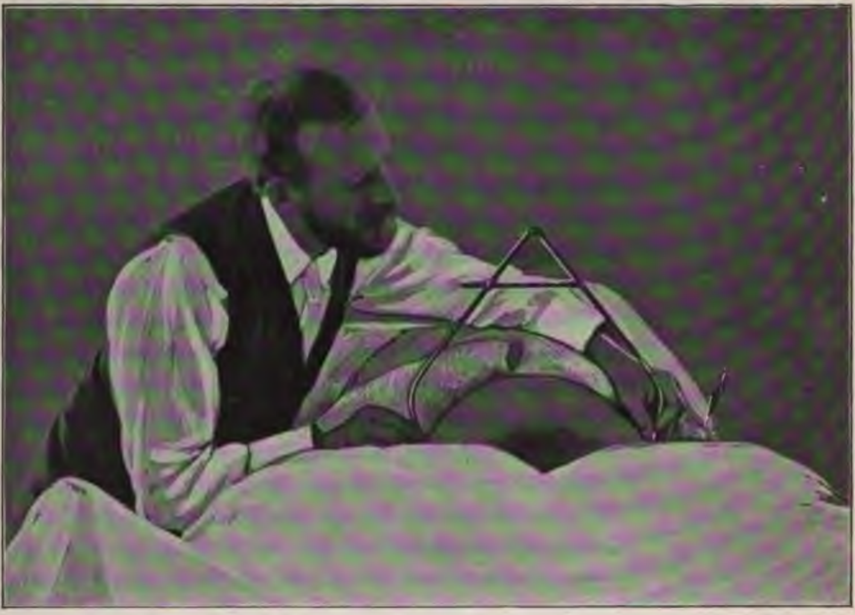


**Fig. 26.—Collyer's pocket pelvimeter.**

PLATE XXXI.



Measurement of Distance Between the Spines.

PLATE XXXII.

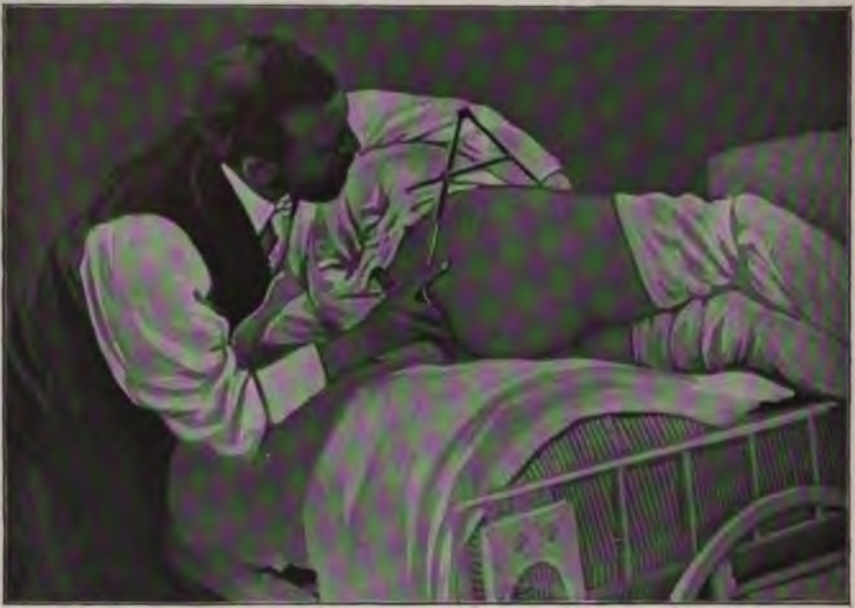


*Fig. 1.—Measurement of Baudelocque Diameter.*

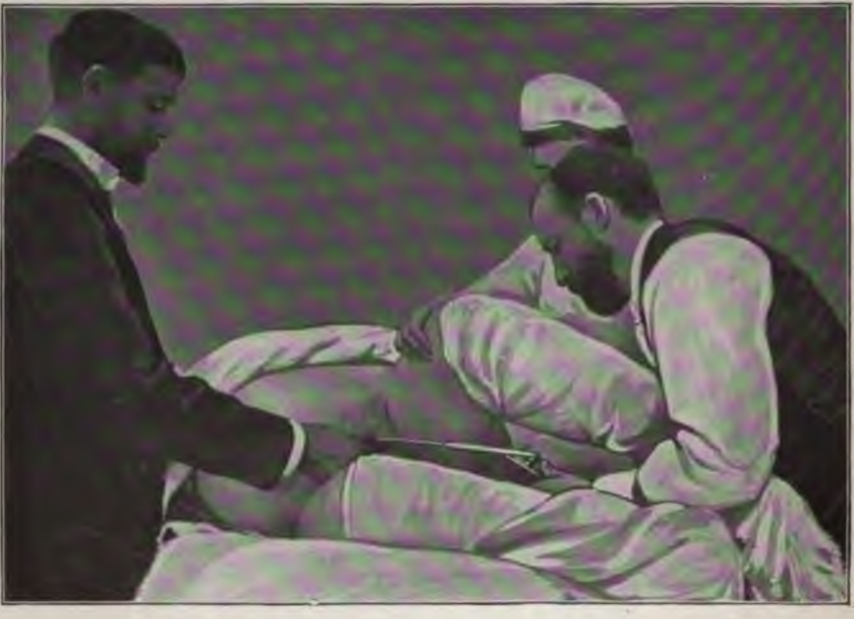


*Fig. 2.—Measurement of Baudelocque Diameter in Case of Pendulous Abdomen.*

### EXTERNAL DIAMETERS OF PELVIS.

The following external diameters are of chief obstetric significance: The distance between the anterior superior spines of the ilium, that between the crests of the ilium, that between the trochanters, that between the depression below the spinous process of the last lumbar vertebra and the centre of the anterior surface of the pubic bones (the diameter of Baudelocque). These are the essential measurements which are to be obtained by means of the pelvimeter. The criticism which has, over and over again, been made to this instrument, that the patient will object to the exposure which it entails, will not hold, for the reason that there need be none, as the patient is covered by a sheet; and, instead of there being objection made, the patient will have a higher opinion of the physician who evidently is taking every requisite precaution for her future safety. It cannot be emphasized too strongly that the physician is to-day not guiltless who, whenever it may be, does not practice pelvimetry. (See Plates XXXI and XXXII.)

In using this or any similar instrument the utmost care must be exercised to adapt the points of the blades accurately to the soft parts (as is shown in the plates), and, in instances where it is of considerable importance to determine with great accuracy the exact measurements, it is advisable that these should be taken by two persons independently. These external measurements, of course, give us purely a relative idea of the internal; but, occasionally, a slight diminution beyond the normal, in one or another diameter, may turn the scale in favor of one over another obstetric operation.

The following external measurements may be taken as normal in the average case, although it should ever be remembered that the estimated capacity of a given pelvis depends on the estimated size of the fœtus which must pass through it:—

| | |
|---|---|
| Distance between the spines ........ | 10 to 10¼ inches. |
| Distance between the crests ........ | 10½ to 11 inches. |
| Distance between the trochanters .... | 12 to 12¼ inches. |
| Diameter of Baudelocque .......... | 8 inches. |

The most important of these external diameters is that of Baudelocque. By means of this external conjugate we are enabled to approximate the true conjugate,—that is to say, the diameter of the pelvic inlet,—the distance from the upper margin of the pubic symphysis to the promontory of the sacrum. In general it may be stated that a mean deduction of three inches from the measurement of the external conjugate will give us that of the true conjugate. As regards the other external diameters, suffice it to say that diminution below the foregoing measurements, which represent a mean from a large number of pelves examined, should always be a source of thought and solicitude to the physician. Certainly, where the diameter of the spines is equal to or less than that between the crests, the pelvis is open to grave suspicion. This matter will be amply considered under the heading of the various operations.

## INTERNAL DIAMETERS OF PELVIS.

Many instruments have been devised for determining the internal diameters. The finger and, if need be, the hand of the physician best subserve the purpose. Obviously, the hand can only be used under anæsthesia; but in every instance where the determination of the internal diameters is of moment in the selection of one operative procedure over another, in view of the almost absolute safety of anæsthesia, this should be resorted to. In the vast majority of cases, however, digital pelvimetry yields us sufficiently exact information in regard to the capacity of the pelvis. This should be practiced as a routine measure in every case. We may thus determine the diagonal conjugate, and, this having been obtained, the true conjugate is readily ascertained by deducting the estimated depth of the pubic symphysis. The transverse and oblique diameters may also be thus approximately measured. To perform digital pelvimetry the patient should occupy the dorsal position, with the nates on the very edge of the bed or couch. The index and the middle fingers of the right hand are introduced into

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PLATE XXXIII.

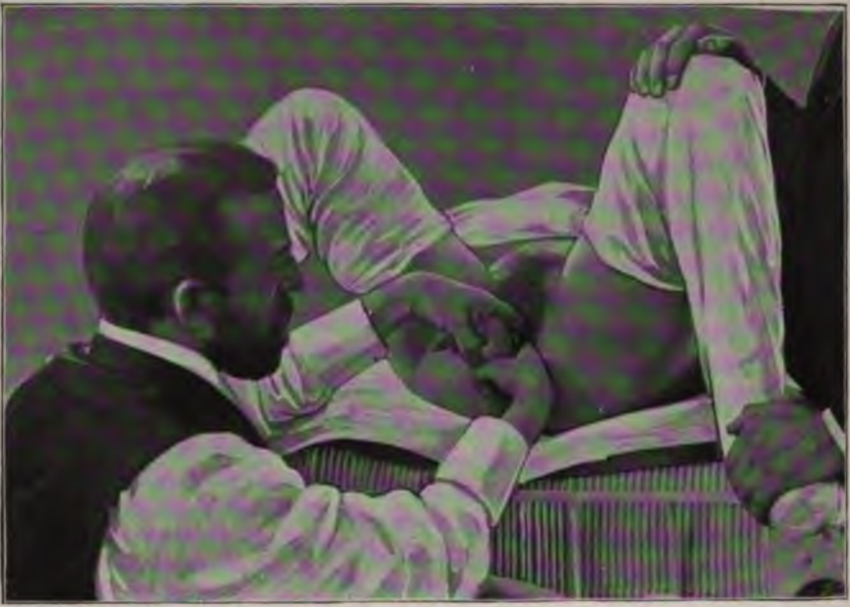


*Fig. 1.—Determination of the Diagonal Conjugate.*

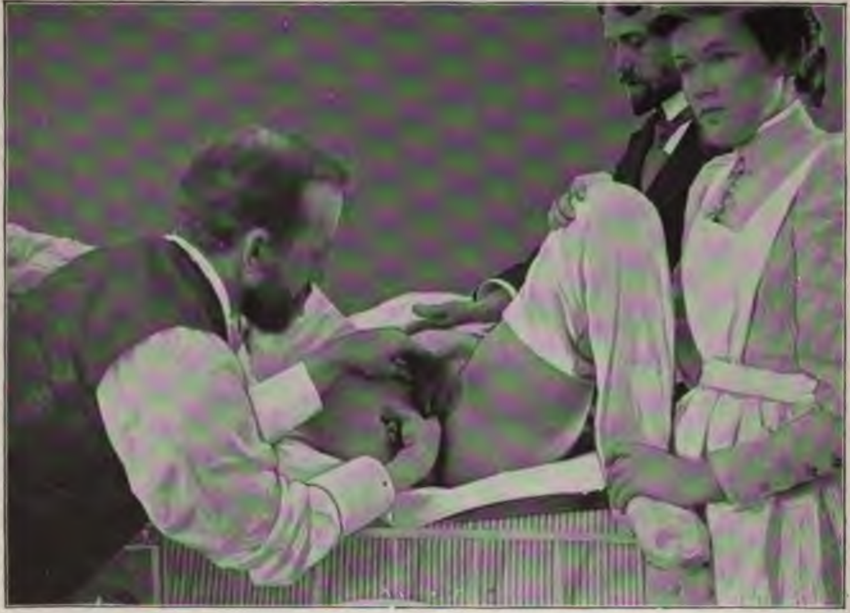


*Fig. 2.—Depression of the Uterus so as to Determine Adaptability of Presenting Part to the Pelvic Brim.*

the vagina, the perineum being depressed as much as possible. The aim of the fingers is to reach the junction of the sacrum with the last lumbar vertebra, for it is the distance from this point to the lower margin of the symphysis pubis which yields the diagonal conjugate. If the sacral promontory cannot be reached, the inference is safe that the pelvis is normal as regards its antero-posterior diameter. If the promontory can be reached, then the wrist is carried upward until the edge of the index finger rests against the pubic symphysis. The index of the other hand notes this subpubic point, the fingers are withdrawn, and, by means of a tape-measure or the pelvimeter, the distance from the end of the middle finger to the noted point on the edge of the index is measured. This measurement is the sacro-subpubic or the diagonal conjugate diameter. (Plate XXXIII, Fig. 1.)

According to the estimated depth and obliquity of the symphysis in a given case, it is necessary to deduct from one-fourth to one-half an inch from this measurement, in order to obtain the dimension of the sacro-suprapubic or true conjugate of the pelvis.

In taking the above measurement it should be remembered that occasionally the first sacral vertebra projects over the second, forming a false promontory. To avoid mistaking this for the true sacral promontory, it is only necessary to depress the perineum or to carry the fingers as high upward as possible. Then, in the event of the existence of a false promontory, the true will be found above it.

The transverse and the oblique diameters of the pelvis cannot be measured with the same exactitude as the conjugate. As a general rule, it may be stated that, when the promontory cannot be reached in a symmetrical pelvis, labor at term is possible with a fœtus of average size. If there be a suspicion, however, of a deviation from the normal in the pelvis, then the welfare of the woman and the fœtus calls for anæsthesia, in order that the entire hand may be inserted into the vagina, so that the capacity of the pelvis may be determined. The sentient hand replaces any and all instruments, and, where still in doubt, anæsthetize and examine with the entire hand in the vagina. This point cannot be emphasized too strongly. The scientific determination of the operative procedure to be elected in the presence of an abnormal pelvis depends on pelvimetry as accurate as possible. The instruments which from time to time have been devised for the purpose of internal pelvimetry cannot take the place of the finger and hand; further, outside of maternity hospitals these instruments will rarely be at the disposal of the practitioner. Usually, fortunately, the careful measurement of the external diameters of the pelvis and the accurate estimation of the true conjugate will give a sufficient estimate of the capacity of the pelvis. Where the estimate thus obtained falls below the normal we repeat, manual pelvimetry under anæsthesia is called for. Further, in the presence of a contracted pelvis, we thus not alone note the capacity and shape of the pelvis, but we also—and this is of equal importance—may form an approximate idea of the size of the fœtal presenting part. (Plate XXXIII, Fig. 2.) Whilst the hand is in the pelvis the uterus may be depressed, and the facility with which the presenting part is likely to engage within the pelvic inlet may be noted. Far too little stress is laid on the relation which the fœtus bears to the canal through which it must pass into the world. A given pelvis may be large enough, although diminished in all its diameters, for a fœtus below the average size, and the reverse is equally true. Could we solve as approximately the size of the fœtus as we can the capacity of the pelvis, the surgical side of obstetrics would be much simplified. As yet, however, we may only form an imperfect and relative idea of the ease with which the fœtal presenting part will enter the pelvic canal. In general, however, if a fœtus can engage at the pelvic inlet the chances are that it can emerge at the outlet, unless, indeed, the alteration in shape of this outlet is marked enough to be determined even by digital pelvimetry. All attempts so far, to gage the size of the fœtal head by external measurements have proven futile. In very thin women, where the fœtal poles may be palpated accurately, perhaps Stone's method may answer, that is to say, after locating the poles apply the ends of the pelvimeter per abdomen to these poles and estimate the measurement after making allowance for the thickness of the abdominal wall.

Aside from the conjugate, the internal diameters of the pelvis which the practitioner should estimate in the average case are as follow, with the dimensions necessary for the birth of the average fœtus:—

| Diameters. | Brim. | Cavity. | Outlet. |
|---|---|---|---|
| Transverse ....... | 5 in. | 5 to 5¼ in. | 4¾ in. |
| Oblique ......... | 4¼ to 5 in. | 5 to 5¼ in. | 4¾ in. |
| Conjugate ....... | 4¼ to 4½ in. | 4¾ in. | 5 in. |

It will be noted from these figures that in the normal pelvis the transverse diameter is widest at the brim and narrowest at the outlet; the oblique is widest in the cavity and narrowest at the outlet; the antero-posterior is widest at the outlet and narrowest at the brim. Therefore, a fœtus of average size, engaging normally at the brim, can pass without assistance through the cavity and emerge at the outlet, if the estimate of the pelvic capacity do not fall below these figures. Where the obtained measurements are below these figures, we are in face of an abnormal pelvis, and the degree of abnormality in relation to the estimated size of the fœtus must be carefully weighed before we are in a position to determine the measures, if any, which are requisite for the safe conduct of the labor.

Before entering into a consideration of deviation of the pelvis from the normal, it is essential to recall briefly the average dimensions of the fœtus at term, for, as already stated, the practitioner must take into account in his estimate not alone the probable capacity of the given pelvis, but also the probable size of the body which must pass through this pelvis.

The weight of the average fœtus at term varies from 6 ½ to 7 ¼ pounds, and the length is about 20 inches. The chief diameters of the fœtal head, with their measurements, are:—

| | |
|---|---|
| rontal | 4¾ inches. |
| nental | 5¼ inches. |
| regmatic | 3¾ inches. |
| ntal | 3¼ inches. |
| to-bregmatic | 3¼ inches. |
| | 3¾ inches. |

sho ever be remembered that during the course of labor diameters, owing chiefly to the presence of the fon- ble of diminution, always, however, at the expense e course of a normal labor the molding of the a descends, flexes, and rotates in the pelvis, results in i ot those diameters which adapt themselves to the most able neters of the pelvis, and the corollary is that in case normal pelvis the aim of the attendant should be to guide the st diameters of the fœtal head into the longest diameters of pelvic canal. Such an aim presupposes accurate knowledge of vic configuration, and hence a further reason for accurate pelvimetry in every case. The problem before the physician is rarely a simple one, and as we pass from a consideration of the normal pelvis to that of the abnormal this problem becomes all the more complex.

## GENERAL CONSIDERATIONS OF ABNORMAL PELVES.

On the accurate determination, as far as possible, of the degree of pelvic abnormality in relation to the estimated size of the fœtus depends the scientific selection of the operative procedure which offers the fairest chance both to the woman and to the fœtus. Only through the deliberate election, in a given case, of a determinate operative procedure can the physician plead that he has done his whole duty by the two beings whose welfare depends on his skill. The midwifery of the present differs in many respects from that of the past. In no respect is the difference more striking than in the growing tendency to elect the proper operation before, in the face of maternal and of fœtal exhaustion, it is forced upon us.

Careful inquiry into the antecedents of the patient; inspection, where need be, of the general configuration of the body,—data of this kind are essential aids in the determination of the nature of pelvic abnormality. Diseases of early life, such as rachitis and marasmus, almost inevitably leave their impress on the pelvis,—an impress which superficial pelvic examination may not reveal, but the knowledge of which will urge the physician to bring all his skill to bear on a more careful and thorough examination of the pelvis.

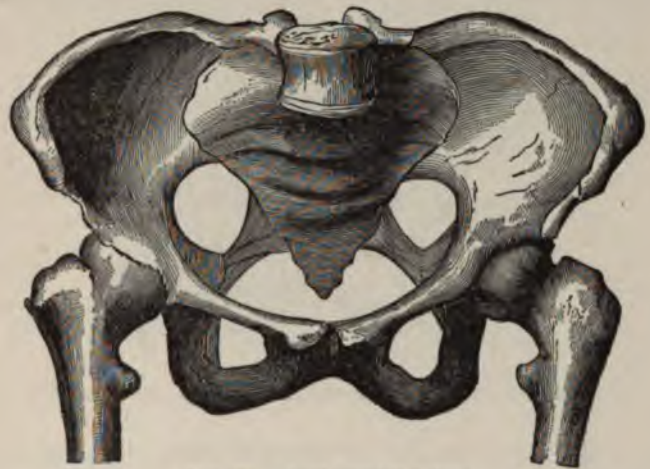


Fig. 27.—Justo-major pelvis.

The abnormalities of the female pelvis may be conveniently divided into minor and major, common and uncommon. In the United States the major deformities are rarely met with, but their determination is a far simpler matter than that of the minor deviations from the normal. It is in the latter class of cases that extreme accuracy is requisite, since at times shades of difference may turn the scale in favor of one or another operative procedure. In instances of major deformity the choice of operation will ordinarily be limited, in the presence of a fœtus of average size, within a very narrow range.

arieties of pelvic deformity and the salient character-
h are as follow:—

*to-major Pelvis.*—The equally enlarged pelvis is of ob-
ficance only in so far as it may lead to precipitate labor
se of the funis. It is not a variety of pelvic abnormality
all likely to call for operative interference. External
will readily diagnosticate the condition, seeing that the
obtained exceed the measurements which have been
normal. The diagnosis, therefore, is chiefly of value as
tendant of the possible complications just mentioned,

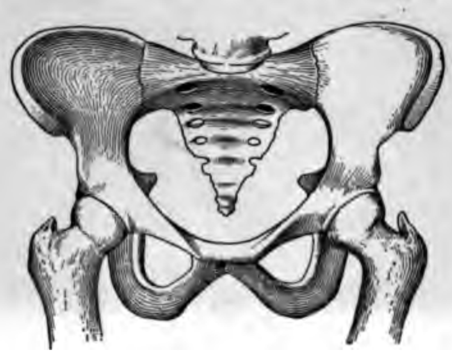


Fig. 28.—Generally-equally-contracted pelvis (justo-minor).

in order that he may be prepared to meet them. Precipitate labor may mean, for the woman, post-partum hæmorrhage, inversion of the uterus, and laceration of the genital tract, and prolapse of the cord may entail fœtal death.

*II. Justo-minor Pelvis.*—This form of pelvic deformity is of infrequent occurrence. The external configuration of the patient and her antecedent history may give us no clue to its presence. It is only through careful pelvimetry, external and internal, that the diagnosis, ordinarily, may be reached. All the diameters of the pelvis are diminished to a greater or less degree, and it is apparent how essential it is to determine the amount of diminution in order to elect the proper operative procedure in any instance where the estimated size of the fœtus suggests that assistance will be needed.

In general, it may be stated, that in the presence of this variety of pelvic deformity, certainly in all but the lesser grades, it is advisable to explore the pelvis manually (under anæsthesia), in order to determine, as approximately as possible, the length of the transverse and oblique diameters from the brim to the outlet. In reported instances the diminution in the diameters has amounted to an inch and over. Early recognition of this type of pelvis, therefore, might suggest the induction of premature labor: if the time for this operation had elapsed the question of choice between forceps and version might arise; in the extreme degrees of contraction the deliberate election of symphysiotomy, pubiotomy, the Cæsarean section, or of embryotomy, would offer as alternatives.

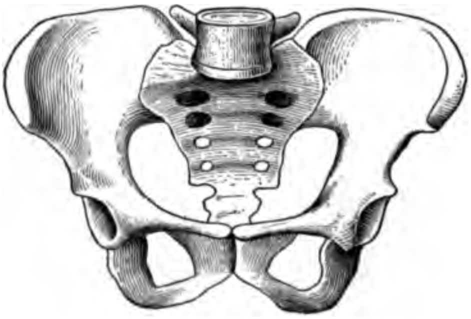


Fig. 29.—Flat non-rachitic pelvis.

*III. The Flattened Pelvis.*—This abnormality of the pelvis may be met with, like the preceding, in women of normal external configuration and of healthy antecedents. It is a type of pelvis very frequently found; so much so, indeed, that many authorities rank it as the most frequent variety of deformity. The etiological cause can rarely be definitely stated. This pelvis is found amongst all classes, the wealthy as well as the poor, amongst those subjected to privations in infancy and to toil before maturity, and those who are reared with tenderest care from the start. Pelvimetry alone, in the vast proportion of cases, will reveal the abnormality, and that its recognition is important is apparent when we recall the well-

ntory to the symphysis may be such as to practically
of the pelvis into two portions.

ance of the recognition of this pelvis before labor
ıs. The contraction at the brim necessarily inter-
ıormal engagement of the fœtal presenting part.
ie fœtus, certainly, depends therefore on the diag-
ormity before long-continued efforts—leading to
d fœtal exhaustion—at engagement have been made.
s evident how accurate pelvic exploration before

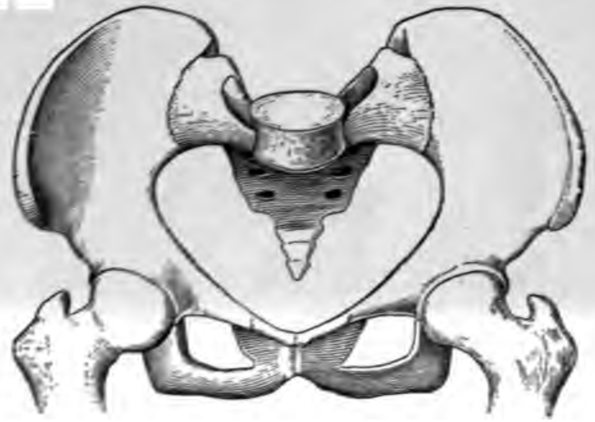


Fig. 32.—Generally-contracted flat rachitic pelvis.

labor may teach the physician that his patient has a pelvis where the judicious election of one or another obstetric operation will redound to the safety of the child, if not always, in this deformity, of the mother. In minor degrees of the deformity, even, the fœtal head cannot enter the pelvic brim obliquely (as is normal). The physician, for instance, if he recognize this, may conclude that the chances for the fœtus are better if he perform version and guide the largest diameters of the head through the largest of the pelvis. The brim once passed, there will be rarely difficulty in the further progress of labor in the pure rachitic type (mild) of pelvis.

The pelves, the characteristics of which have been tersely passed in review, constitute the varieties with which the practitioner will ordinarily come in contact. As a rule, these pelves, except the higher grades of rachitic deformity, rarely suggest themselves from inspection of the general configuration of the patient. The varieties which are next to be considered are of rare occurrence, certainly in English-speaking countries, and, as a rule, the appearance of the woman at once suggests the existence of pelvic deformity. Accurate pelvimetry, however, is none the less requisite, seeing that due recognition of the exact deformity may, the time being opportune, point infallibly to the necessity of the induction of premature labor or even of artificial abortion, in order to avoid at term embryotomy of the living fœtus in instances where the indication for the Cæsarean section is not absolute, and yet, where this operation cannot, for one or another reason, be deliberately elected.

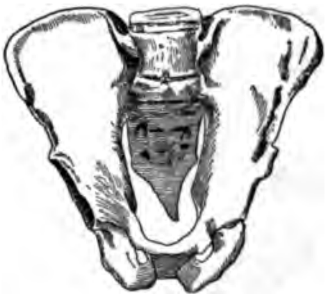


Fig. 33.—Robert's pelvis. The transversely-contracted pelvis.

(a) *The Transversely-Contracted Pelvis.*—This type is also known as Roberts's pelvis, from the fact that he first described it. It is an uncommon variety of pelvic deformity, only about thirteen instances being on record. The chief internal characteristic of this pelvis is its division into two halves antero-posteriorly. This is due to progressive narrowing of the transverse diameter from the brim to the outlet. The conjugate diameter, on the other hand, differs but little, if any, from the normal. The sinking of the sacrum into the pelvis is marked, the posterior superior spines are close together, and the iliac bones project greatly posteriorly.

(*b*) *The Kyphotic Pelvis.*—Inspection of the patient and the antecedent history will at once suggest this deformity. The etiological cause is Pott's disease, and, according as this disease has affected one or another portion of the spinal column, the anterior deviation of the column is in the dorsal, lumbar, or sacral region.

The effect of the spinal deviation on the pelvis is variable. In general, however, the pelvis offers the following characteristics:

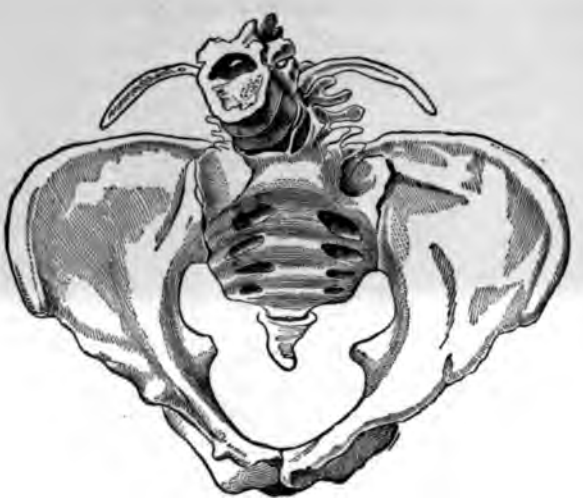


**Fig. 34.**—The kyphotic pelvis, showing narrowing in the transverse diameter and lengthening in the conjugate.

The true conjugate is increased, the transverse diameter is lessened at the brim, diminished in the cavity, and still more so at the outlet. The sacrum is carried upward and backward; the pubic arch, as a rule, is narrowed. Where Pott's disease has developed in infancy, the total result, as regards the pelvis, is that its growth is arrested. This pelvis, in general, will call for the induction of premature labor, for at term the choice will almost necessarily lie between the Cæsarean section and embryotomy, except in an instance of very small fœtus.

(*c*) *The Scoliotic Pelvis.*—It is essential to differentiate two types of scoliotic pelvis,—the rachitic and the non-rachitic,—for the characteristics are markedly different.

In case of the non-rachitic scoliotic pelvis the diminution in the diameters is only exceptionally great enough to prevent delivery at term. The chief characteristics of the pelvis are: The side of the pelvis toward which the spinal column deviates is flattened to a greater or less degree. As a result one of the oblique diameters is shortened, but the other may not be altered. The pelvic inlet is chiefly the seat of contraction.

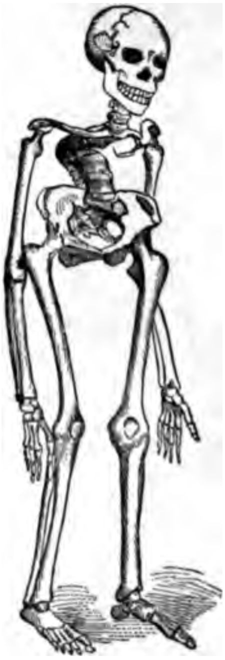


Fig. 35.—Non-rachitic scoliotic skeleton.

The rachitic scoliotic pelvis, on the other hand, presents alterations which differ in degree according as the rachitic changes have supervened in early infancy or later. Leopold states the following as the striking characteristics of this pelvis: There is considerable shortening of the true conjugate owing to the projection forward of the sacral promontory. There is greater or less asymmetry of the pelvis according to the degree of lateral curvature of the spinal column. The symphysis of the pubes is deviated toward the side opposite the scoliosis.

At the pelvic inlet there is contraction on the side of the scoliosis and widening on the other, whilst at the outlet the reverse holds true. The antero-posterior diameter is here diminished, but more to the same degree than the true conjugate.

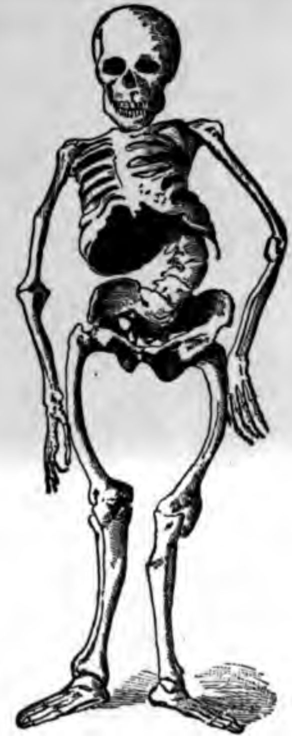


Fig. 36.—Rachitic scoliotic skeleton.

In the usual variety of scoliosis the dorsal vertebral column is curved toward the right, and the compensatory lumbar curve is toward the left; the pelvic capacity, therefore, is ordinarily diminished on the right. If the fœtus can be born spontaneously, it must be through the wider (left) half of the pelvis, and in a given case, where the scoliosis is right-sided, the physician in his manipulations should remember that it is within the left half of the pelvis that he can alone work.

(*d*) *Spondylolisthetic Pelvis.*—This pelvis results from the sliding downward of one or more of the lumbar vertebræ on the first sacral vertebra, forming a false promontory anterior to and below the true. The result is marked narrowing in the conjugate, —to such a degree, in extreme cases, that the fœtus cannot enter the pelvic cavity. The deformity was first described by Kilian. Neugebauer has most elaborately studied it, and, as a result of his analysis of forty-three cases, he reaches the conclusion that the deformity is not the result of a dyscrasia, but of the physiological weight of the trunk. This explanation, however, hardly accords with the data furnished by the museum specimens, seeing that in the majority there is evidence of the destruction of one or more of

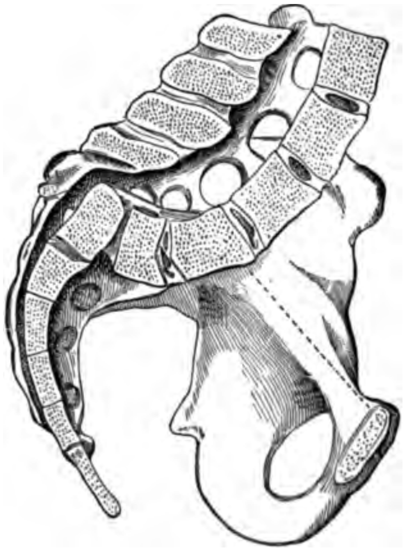


Fig. 37.—Spondylolisthetic pelvis.

the lumbar or sacral vertebræ, suggesting Pott's disease as a causative factor.

The recognition of the deformity offers no difficulty. The contour of the lumbar spine at once suggests deformity, and digital internal pelvimetry reveals the nature of the obstruction. This form of pelvis, if detected early enough, calls for the induction of premature labor. At term the indication for the Cæsarean section may be absolute.

(*e*) *Funnel-Shaped Pelvis.*—This variety is so exceedingly rare as to call for but passing notice. The name accurately describes the appearance of the pelvis. There is slight contraction in all the diameters at the pelvic inlet, and this narrowing increases progressively to the outlet. Recognition is easy if internal pelvimetry be not neglected, and, again, we have a pelvis where wise conservatism will counsel the induction of premature labor, for at term the choice will almost inevitably lie between the Cæsarean section and embryotomy or pubiotomy.

(*f*) *The Osteomalacic Pelvis.*—The disease causing this deformity usually develops after puberty, appearing, as a rule, during the gravid state. The early stages of the disease are characterized by the presence of acute pain in the limbs and pelvis, and this symptom during pregnancy should suggest the development of the disease, and should call for careful pelvic mensuration by means of the entire hand. The disease is very rare in the United States. In Italy and in certain portions of lower Germany it is frequently met with. The etiological causes are the same as those of rickets; but, except in advanced cases, the external configuration of the woman will not suggest pelvic deformity.

The characteristics of the osteomalacic pelvis are: The bones, in general, are softened; the sacrum is small, the promontory sinking into the pelvis and approximating the symphysis. The lumbar vertebræ, in consequence, approach the pelvic brim. The rami of the pubes bend inward, the pubic angle being sharply acute and shaped like a beak. The external measurement between the iliac spines is less than normal, and that between the crests exceeds that between the spines. As a rule, the outlet of the pelvis is narrower than the inlet. Whilst the conjugate diameter may be only slightly narrowed, the transverse is considerably so at the brim and more so in the cavity and at the outlet.

In the slighter degrees of deformity due to osteomalacia, internal pelvimetry by the entire hand is absolutely essential, not alone for accurate diagnosis, but also for determining the extent to which the softened pelvic bones can be made to yield to pressure.

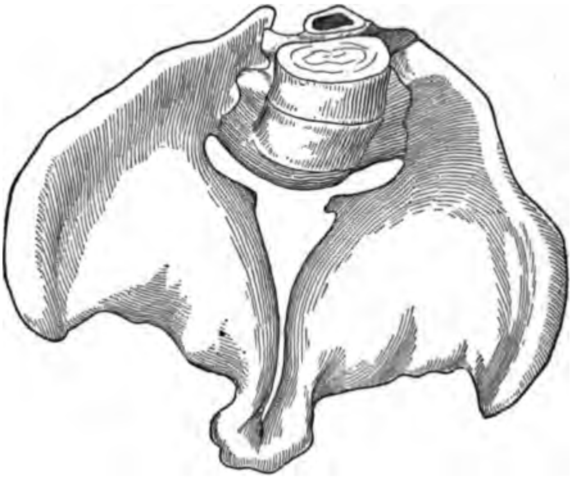


Fig. 38.—The osteomalacic pelvis.

It is very essential to determine this latter point, for on this depends the determination of delivery *per vias naturales* with safety to the woman. In many of the reported instances of osteomalacia the indications for Cæsarean section have been absolute. Of 72 cases collected by Litzmann, 38 could not be delivered naturally. It is also to be remembered that the disease is aggravated in successive pregnancies.

If recognized in time, the osteomalacic pelvis calls for the induction of premature labor; in aggravated instances, for artificial abortion. If determined only at term, whilst the pelvis may yield sufficiently to allow of the delivery of the fœtus, in the vast proportion of cases the physician will be called upon to elect either embryotomy or the Cæsarean section,—here, as always prior to maternal exhaustion, the result of ineffectual efforts at delivery.

(*g*) *The Oblique Ovate Pelvis.*—This form of pelvic deformity was first described by Naegele. As a rule, the woman offers no external signs. The broad characteristics of the pelvis are the diminution of one oblique diameter associated with ankylosis of one of the sacro-iliac synchondroses. The pelvis is asymmetrical, one side of the sacrum is lacking in development, and the bone is pushed toward the affected side. The pubic symphysis is obliquely opposite the sacrum. The arch of the pubes is narrowed. The true conjugate is, as a rule, longer than normal; the transverse is narrowed at the brim, and this narrowing increases progressively toward the outlet. Pelvic mensuration of the lateral halves will reveal the asymmetry.

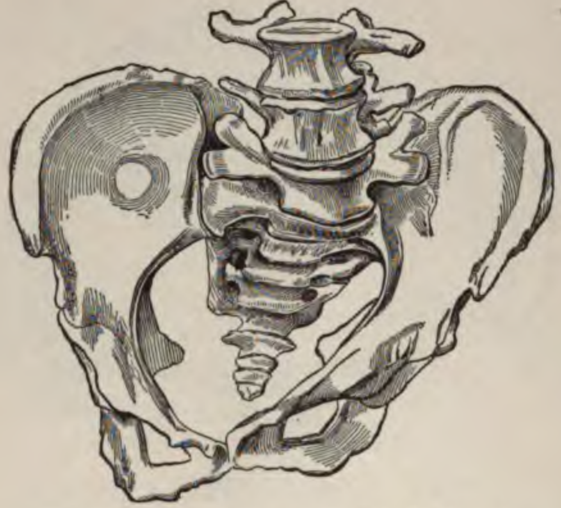


Fig. 39.—Obliquely-distorted pelvis of Naegele.

In aggravated instances the rule as regards the external configuration will not hold. The woman limps, one hip is higher than the other, and deviation of the pubes is marked. In such an instance the following measurements, which are the same in a normal pelvis and shorter on the affected side in the oblique ovate pelvis, should be taken as assisting in diagnosis: From the tuberosities of the ischium to the opposed posterior superior spines of the ilium; from the anterior superior to the opposite posterior superior spines; from the spinous process of the last lumbar vertebra to the anterior superior spines. These measurements may readily be taken with the pelvimeter. The oblique ovate pelvis is of not infrequent occurrence. The necessity of recognition is apparent from the statement that in a series of instances collected by Litzmann, 22 out of 28 women died, and out of 41 children 31 were lost. Such results are explainable alone on the assumption that the variety of deformity was not recognized before term. This pelvis calls strictly for the induction of premature labor in order to avoid the choice at term between the Cæsarean section and embryotomy. Only exceptionally, and then in the lesser degree of the deformity, can spontaneous labor at term occur, or will, at this time, version or the forceps be safe for the woman. Symphysiotomy is contra-indicated.

(*h*) *Pelves Deformed by Tumors.*—The presence of tumors within the pelvic cavity obviously interferes with the progress of labor and may even render delivery by the natural passages impossible. These tumors may be bony projections (exostoses), osteosarcomata, carcinomata, fibroids of the uterus, ovarian cysts; such, at least, are the common varieties. According to the size of these tumors will vary the obstetric operation requisite for delivery. Ordinarily their presence may be detected only by exploration of the pelvis; hence a further reason for the rule already dwelt upon,—the necessity for examining the pelvis of every gravid woman at an early date of gestation. Such a rule, if ordinarily followed, and if its necessity be recognized by every woman, will, time and again, result in the choice of a minor operative procedure,—such as artificial abortion or the induction of premature labor, in instances where, if the woman be only examined at term, the indication for the Cæsarean section may be absolute. Further, in case of pediculated fibroids, for instance, the risk resulting from impaction within be avoided where the woman is seen in the early on, seeing that, at times, manipulation in the proper knee-chest—may enable the physician to push the he brim; and in case of an ovarian cyst, for instance, of abdominal section for its removal might well be hysician.

sec s, cancerous, sarcomatous tumors which spring from ot pelvic cavity will, as a rule, if not detected till term, emb otomy or for the Cæsarean section, possibly for the q It must be recognized as unscientific, to say the o att pt delivery by either forceps or version where the

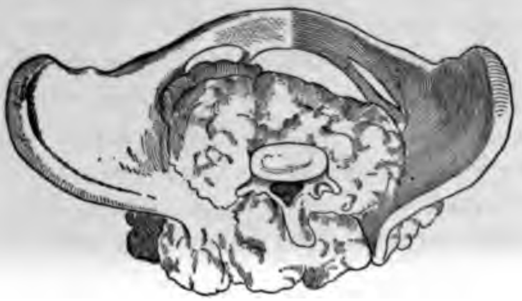


Fig. 40.—Osteosarcoma of the pelvis.

fœtus is estimated at average size and the tumor narrows the pelvis sufficiently to warrant the assumption that delivery without mutilation is problematical. Aside from the death of or injuries inflicted upon the child by the attempts at forceps extraction, the trauma the woman would necessarily be subjected to is a distinct contra-indication.

From this analysis of the salient characteristics of deformed pelves it is apparent how helpless the practitioner may be, at the term of gestation or when labor is advanced, if, for one or another reason, he has neglected or it has been impracticable to estimate the capacity of the pelvis either at an early stage of gestation or before the onset of labor.

Without the data obtainable through pelvimetry and exploration of the pelvis, it is impossible to elect the obstetric operation, where one is demanded, which best subserves in a given case the interest of the two beings whose safety depends on the acquired knowledge and expertness of the accoucheur. In practical obstetrics, the forceps, for example, is too often used in instances where accurate pelvimetry will teach that it is contra-indicated. The major obstetric procedures are too frequently delayed until maternal and fœtal exhaustion is imminent or present. The facts on which stress has been laid teach the necessity of deliberate election of every obstetric operation, and it is from this stand-point that these operations will be considered.

A few words in reference to Prochownick's dietetic methods. In instances of minor contraction of the pelvis or in multiparæ where the previous labor has been unusually difficult owing to the size of the child, something may be accomplished through resort to dietetic and medicinal measures during pregnancy. Such methods are known after Prochownick, and constitute a reduction treatment. Starches and sugars are cut from the diet and only a limited amount of water is allowed. The woman is encouraged to exercise, and iodide of potass in increasing doses daily is ordered. The bowels are moved freely through the administration of salines, preferably the Carlsbad salts. Thyroid is ordered cautiously, pushed to the point of tolerance. When this is reached the woman becomes nervous and suffers from cardiac palpitation on exertion. If the dosage of this extract be excessive effect on the fœtus has been noted, as evidenced by diminution and feebleness of the heart-beats, this may be counteracted through the administration of the chlorate of potassium and the tincture of the chloride of iron. Under the indications mentioned, these dietetic and medicinal measures should be given a trial.

## CHAPTER XIII.

## ARTIFICIAL ABORTION AND THE INDUCTION OF PREMATURE LABOR.

The term "abortion" is applied to instances where the uterus is emptied of the product of conception either spontaneously or artifically before this product has reached that stage of development when it is fitted for extra-uterine life. Artificial abortion, therefore, is performed purely in the interests of the woman. Premature labor, on the other hand, when induced, carries with it the assumption that the fœtus is capable of surviving apart from the mother,—that is to say, that this fœtus has reached what is termed the viable age. This operation, then, is resorted to both in the interests of mother and child, although ordinarily those of the former chiefly urge the physician to resort to it. The induction of premature labor is, in general, an elective operation; artificial abortion is usually forced on the physician. The factors calling for the one operation are usually different from those calling for the other, and the method of procedure also differs. It is useful, therefore, to consider the subjects apart.

### (*a*) Artificial Abortion.

The diseases and anomalies which justify artificial abortion are: 1. Advanced pulmonary and cardiac disease. 2. The pernicious vomiting of pregnancy. 3. Renal, liver and intestinal toxæmia. 4. Pernicious anæmia. 5. Chorea. 6. Absolute pelvic contraction or occlusion of the genital tract by tumors, etc. 7. Irreducible displacements of the uterus. 8. Hæmorrhage from placenta prævia, hydatid mole, etc.

Bearing in mind strictly the fact that artificial abortion is performed purely in the interests of the woman, we will consider these indications *seriatim*.

1. *Advanced Pulmonary and Cardiac Disease.*—At a glance it is apparent what an untoward effect gestation, if allowed to advance, must have on the life-limit of a woman in an advanced stage of phthisis or with serious cardiac lesion.

The vital force of the woman is being actively expended in fighting the disease which shortly will kill her when, in addition, the extra burden of supporting fœtal growth for nine months is thrown upon her. If such a woman be allowed to go to term, even if she can withstand the strain of pregnancy and of labor, the duration of her remnant of life has unquestionably been shortened, and she will rarely have the satisfaction of leaving behind her a healthy babe. Wise and justifiable conservatism, therefore, counsels the artificial arrest of the pregnancy as soon as detected, in case of advanced phthisis and of a cardiac lesion which has progressed to the stage of dilatation.

The indication may be said to be absolute in the former instance; in the latter only when the heart has begun to dilate, since otherwise the physiological cardiac hypertrophy of pregnancy will enter as a compensatory factor, and enable the woman to reach term with safety, and, likely enough, not deteriorated in general health.

2. *The Pernicious Vomiting of Pregnancy.*—This indication may be called absolute only after the recognized general and local remedies have been tried. Rectification of a uterine displacement, applications of solutions of nitrate of silver to the cervix, digital or instrumental dilatation of the cervix, regulation of the diet and of the function of the intestinal canal, the internal administration of drugs (oxalate of cerium in large doses, ingluvin, minim doses of ipecac or of phenic acid), lavage of the stomach,—such, briefly stated, are the chief measures on which dependence may be placed for the relief of pernicious vomiting. Only after such means have been tested does artificial abortion suggest itself as justifiable. It should then be deliberately elected. The physician should not wait until the emaciation is extreme, the pulse is rapid, and the

fever of exhaustion sets in. On the occurrence of phenomena of exhaustion, the operation may fail in its object,—the saving of maternal life,—and generally emptying of the uterus is postponed too late. The fact that the vomiting, even when of the so-called pernicious type, in many instances ceases spontaneously at the third month, whilst a cause for hope, should never blind the physician to such a degree as to lead him to expectancy overlong. Whilst, as a rule, artificial abortion, under this indication, is rarely called for, it is safer not to wait until the vital forces of the woman are at too low an ebb.

3. *The Toxæmias.*—Under this heading, according to modern views, are included toxæmias emanating from kidney or from liver or from the intestinal canal. Not infrequently the three are present. Often we are unable to differentiate clinically without most careful examination of the urine. As has been noted, when considering the subject of the toxæmias during pregnancy, albumin and casts no longer constitute our guides, but these *plus* kidney insufficiency, *plus* the presence of aceton and free acids and indican. We also laid stress on the information to be gained from nitrogen determinations, at the same time pointing out the fact that the exigencies of routine practice prevented such tests being made. In the event of a toxæmia, single or combined, existing, as shown by the urine, the question of interference simply hinges on whether under suitable dietetic and other measures the clinical picture improves. If not, then eclampsia with its train of symptoms is bound to develop if the uterus be not emptied, always after due consultation. As regards the supervention of gestation in the presence of parenchymatous or interstitial nephritis, should milk diet and iron and the milder diuretics not alter the clinical picture, nothing is gained by delay, since, apart from the imminence of eclampsia, the progress of the disease is hastened. This question is considered at greater length under the subject of "Therapeusis."

4. *Pernicious Anæmia.*—This indication will rarely offer, for the reason that the affection is only exceptionally met with, and then conception is a rarity, owing to the lack of function of the

ovaries. In the event, however, of pregnancy supervening on this depraved condition of the blood, artificial abortion is justifiable as soon as it becomes apparent that the anæmia, notwithstanding the recognized remedies, is becoming deeper. To wait longer is to aggravate the disease, only to obtain a fœtus incapable of extra-uterine life.

5. *Chorea.*—Pregnancy has a deleterious influence on chorea. In all the reported instances the choreic movements have become aggravated often to an extreme degree. Nature sometimes asserts herself and abortion is spontaneous. On the other hand, it cannot be positively predicated that emptying the uterus will modify the chorea favorably. The indication, therefore, for artificial abortion is not an absolute one. The operation should be resorted to only in extreme instances, and then only in the hope that it may prove a remedial measure. Barnes's statistics prove that gravid choreic women often die of the disease, and that the fœtus rarely survives. It should further be remembered that in a few recorded instances chorea associated with pregnancy has merged into one or another variety of insanity.

6. *Absolute Pelvic Contraction or Occlusion of the Genital Tract by Tumors, etc.*—By absolute pelvic contraction is understood that degree of pelvic deformity which will not even permit of the induction of premature labor with viable child. This will be amply considered when the subject of premature labor is discussed. As soon as determined, artificial abortion is indicated in order to save the woman the risks of the alternative operations at term,—the Cæsarean section or the Porro.

Until the results from these operations are of such a nature as to present no greater mortality-rates than that after abortion, the duty of the physician, unless the woman deliberately elects the major operations, is to empty the uterus. The same view may be taken of instances of cicatricial contraction of the vagina of such high degree as to preclude the successful induction of premature labor. The tumors which come under consideration, aside from exostoses, are fibroids in the lower uterine segment, epithelioma of the cervix, impacted ovarian cysts. Exostoses, if sufficiently prominent to occlude the pelvis to a degree inconsistent with the successful induction of premature labor, will always call for artificial abortion unless, again, the woman elects the Cæsarean section at term; fibroids in the lower segment of the uterus do not, as a rule, interfere with the development of the uterus to the term of fœtal viability, at any rate; but at this date, and later, the choice will necessarily lie between enucleation of the fibroid *per vaginam* before delivery can be effected or else the Cæsarean section or the Porro. Enucleation of a fibroid by the vagina is at best a formidable operation, and becomes all the more so in the presence of the vascularity associated with pregnancy. To say nothing of the risk of septicæmia during the puerperium, the safety of the woman is best subserved by emptying the uterus at an early stage, unless, again, in full view of its risks, she elects the alternative operations at term. It is understood, of course, that an ovarian cyst impacted in the pelvis cannot be removed through abdominal section without first emptying the uterus; therefore, the proper course to pursue is to induce abortion, and at one and the same time to remove the cyst by one or another of the recognized methods. Epithelioma of the uterus, whenever discovered, should be removed by vaginal hysterectomy. Advanced carcinoma of the lower uterine segment, when complicated by pregnancy, becomes all the more serious the longer the gestation is allowed to continue. The chief risk the woman runs is that from sudden profuse hæmorrhage; but, seeing that the woman may be made more comfortable by a partial operation, this should be resorted to even though it interrupt gestation. At term delivery *per vias naturales* might be possible without fatal result to the woman; but this being problematical, active interference is justifiable before the child is viable. Fortunately, women with advanced carcinoma rarely conceive.

It is a recognized surgical rule, to-day, to remove an ovarian cyst as soon as it is discovered. If pregnancy coexist, ovariotomy may be performed and the gestation not interrupted. This is exceptional in the favorable case, when the tumor is not impacted in the pelvis. In the latter instance the maternal chances are better if the uterus be first emptied *lege artis*, and the ovariotomy be performed afterward. Obviously the physician should be on his guard lest, during the process of abortion, the cyst rupture. Puncture of the cyst by the vagina as an elective measure cannot too strongly be condemned. Whilst such a measure will diminish the size of the tumor, and thus, perhaps, enable the gestation to advance nearly or to term, with resulting viable fœtus, puncture, however aseptically performed, carries with it the risk of suppuration of the cyst, in which event neither abortion nor ovariotomy might avail to save the woman. Obviously, where the obstructing tumors are so large as to interfere with access to the uterine cavity, it ceases to be a question of even artificial abortion, and the physician is called upon to decide upon the relative risks of interference surgically with the tumor before or at term. Where the risk is equal the latter period should, of course, be selected, since the child is then given a chance.

7. *Irreducible Displacements of the Uterus.*—No displacement of the uterus uncomplicated by adhesions must be considered irreducible so as to require artificial abortion until replacement under anæsthesia, with the woman in the knee-chest position, has failed. Simpler methods are, of course, first to be tested. Impaction of the gravid uterus below the promontory of the sacrum may simulate an adherent uterus; but if the woman assume the knee-chest position and the cervix be drawn downward by means of a tenaculum inserted into the anterior lip, reposition may, as a rule, be effected if the displacement be uncomplicated. In an instance of this nature, if seen before the third month, emptying of the uterus will rarely be called for. It is the adherent fundus which generally will give rise to trouble. Unquestionably, in many of these instances the adhesions stretch and enable the uterus to rise above the brim; but where this does not occur, gentle attempts at manual stretching of the adhesions having failed, artificial abortion should be resorted to before the uterus, developing asymmetrically, —in case spontaneous abortion do not occur,—causes grave symptoms from the side of the bladder, possibly leading to rupture of the

organ. It may prove profitable, in the future, the woman consenting, to open the abdomen and, after breaking the adhesions, to replace the uterus.

8. *Hæmorrhage.*—The slight discharge of blood which not uncommonly complicates the early months of pregnancy will never call for artificial abortion. Rest in bed with appropriate remedies—such as the viburnum prunifolium and, perhaps, an opiate; removal of the cause, such as a small submucous polyp—will, as a rule, suffice to check what at times is simply an attempt at periodical menstruation. It is the hæmorrhage met with between the third and sixth months of gestation which may warrant abortion. Hæmorrhage at this period should always suggest a low attachment of the placenta, and, when profuse enough to threaten maternal exhaustion, it is conservative to empty the uterus rather than to endeavor to tide over the patient until the fœtus has attained viability.

Such, briefly outlined, are the complications of early pregnancy which chiefly will call for artificial abortion. This operation should never be determined upon without the advice of a consultant. The risk to the woman where the operation is carefully performed is slight, presumably always slighter than that she is subject to if the gestation be not interrupted; but no physician, except in strict emergency, should induce an abortion without the support of one or more consultants. He will thus be amply protected against scandal and legal process, should either arise.

In view of the fact that artificial abortion is an operation which is forced upon the physician, when the indication presents the object is to empty the uterus as rapidly as is consistent with the welfare of the woman. The method of procedure about to be described is peculiarly applicable to gestation which has not advanced beyond the third month. After this period, the fœtus and its adnexa being larger, and fuller dilatation of the cervical canal being therefore requisite, the method to be described under the subject of the induction of premature labor is to be selected.

The administration of so-called abortifacients and resort to electricity are proposed methods for the induction of abortion which are so problematical in their results as not to be worthy of trial. Tamponing the vagina, associated with the administration of ergot, was a method formerly greatly in vogue. It should be rejected, however, because it is slow in action, uncertain in its results, and difficult to maintain aseptically. The sponge tent for dilating the cervix cannot be too strongly condemned, on the ground that the chances of sepsis following its use are very great. It should ever be borne in mind that the operation is performed in the interest of the woman, and that the one risk the physician subjects her to is sepsis.

### OPERATION FOR THE INTRODUCTION OF ABORTION.

The instruments strictly requisite are: A steel-branched uterine dilator, a uterine dull and sharp curette, an ovum forceps, an intra-uterine irrigating tube, the finger. These instruments should be carefully sterilized.

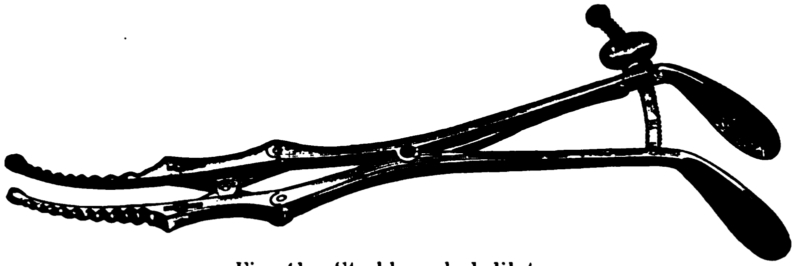


Fig. 41.—Steel-branched dilator.

The intestinal canal should be thoroughly emptied by enema, and extra care be taken lest the colon bacillus enter the vagina. The bladder must be emptied by catheter after precedent cleansing of the introitus of the vagina. The external genitals must be rendered sterile after the manner before laid stress upon. The vagina should not be scrubbed since Nature's sentinel, the lactic acid bacillus, prevents the entrance of germs or destroys them should they gain access. Where, during the operation, continuous irrigation is preferred, one per cent. lysol solution answers well.

The hands of the operator and of his assistants are prepared as before directed. These details are called for in order to avoid septic infection of the patient,—the risk, we would repeat, which the woman is subjected to. As a rule, it is desirable to anæsthetize the patient. The operation, when resorted to at all, must be thorough, and it is difficult to secure this if the patient be struggling and complaining. The patient is placed upon the table in the left lateral or dorsal position, according to the preference of the operator. We prefer the dorsal position because all the necessary steps are best followed in this position, and because, furthermore, the uterus is under better control. A speculum is inserted into the vagina, and, the cervix having been exposed, a tenaculum is inserted into the anterior cervical lip to steady the uterus.

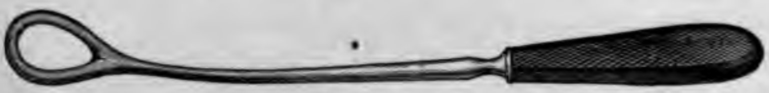


Fig. 42.—Uterine curette.

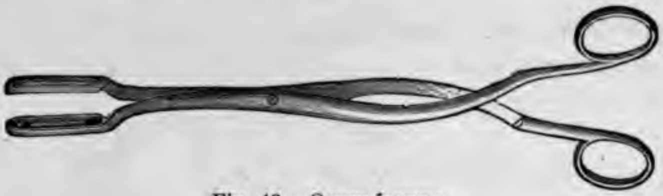


Fig. 43.—Ovum-forceps.

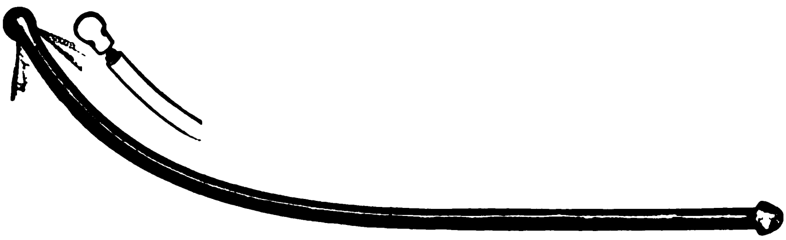


Fig. 44.—Glass irrigating-tube.

The steel dilator is passed into the cervix beyond the internal os, and the canal is slowly stretched to the extent of an inch and a half to two inches. The cervical muscle is made to yield to the applied pressure; the aim is not to rupture the cervix. Owing to the hyperæmia and softening of the cervix, which, as a rule, is present even in the early months of pregnancy, dilatation to this extent will ordinarily be possible. The instruments are then to be removed, and the next step is the extraction of the ovum.

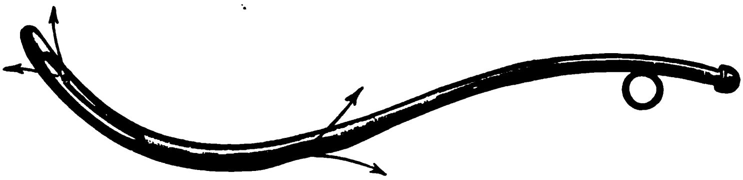
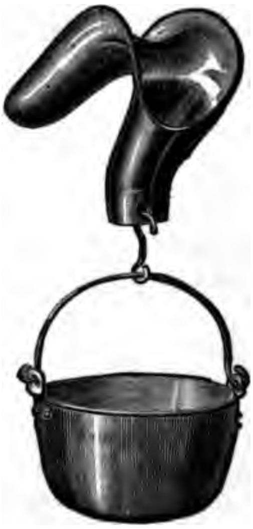


Fig. 45.—Fritsch-Bozeman catheter.



46.—Edebohls's speculum.

The best of all instruments for the loosening of the ovum, the breaking up of the fœtus, and for the removal of the *débris* is the aseptic finger. It is sentient, and therefore it is less likely to do harm than any instrument. We are operating to protect the interests of the woman, and, therefore, must take every precaution to see that these interests are not endangered. In the average case of abortion under the third month it is possible to empty the uterus by the finger alone, provided the physician proceed as follows: The woman should be anæsthetized. The fundus of the uterus is grasped through the abdominal wall, and the organ is depressed deeply into the pelvic cavity in the axis of the inferior strait. The other hand is introduced into the vagina, and the index finger is inserted to the fundus of the uterus, slowly, in order to obtain greater dilatation than has followed the use of the dilator. The ovum is then carefully peeled from its connection with the uterus. Up to the second month of gestation it may ordinarily be removed in its entirety. Beyond this period it is usually necessary to break up the ovum by the intra-uterine finger, and this may be accomplished without great difficulty, provided the external hand firmly controls and steadies the uterus.

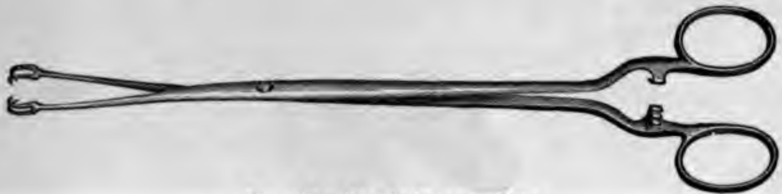


Fig. 47.—Cervical tenaculum.

In instances where it is not possible to depress the uterus sufficiently to enable the finger (the hand being in the vagina) to reach the site of the ovum, the long uterine curette takes the place of the finger. The instrument, however, should be used simply to loosen the connection of the ovum with the uterus, the after-extraction being accomplished either by means of the ovum-forceps or by the finger. The manipulation is as follows: The curette seeks to penetrate between the ovum and the uterine wall, the external hand being conscious of and thus indirectly controlling the action of the instrument. When dislodged in this manner, if the finger cannot complete removal, the ovum-forceps should be used to grasp and to extract it.

The hæmorrhage from these manipulations is, as a rule, considerable, but the external hand grasping the uterus may soon cause efficient contraction. When satisfied that the uterus has been thoroughly emptied, ½-drachm of ergot or 10 minims of ergotole should be injected into the nates, the intra-uterine tube should be inserted into the cavity of the uterus and the organ washed out either with a 1 to 5000 solution of bichloride of mercury or with a 3-per-cent. solution of creolin. The last step, and we believe a most important step, is the insertion to the fundus of a sterilized-gauze drain.

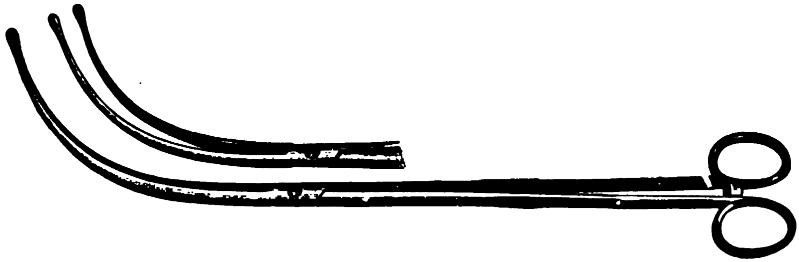


Fig. 48.—Intra-uterine dressing-forceps.

In regard to irrigation of the uterus, mentioned here and elsewhere, Marx does not sanction it, on the grounds that it is unnecessary and further carries the risk of infection. Again, in the event of the uterus having been perforated, such irrigation may carry infectious material into the peritoneal cavity. This last reason is most cogent, and, should perforation occur, irrigation should never be resorted to but the cavity should be packed with sterile gauze. As a routine measure Marx prefers wiping out the cavity with gauze. Except under the limitation noted, Grandin prefers one thorough irrigation of the uterus taking self-suggestive measures for securing asepsis.

The object of this drain is twofold: At times, owing to flexion at the level of the internal os, drainage from the uterine cavity is imperfect and the retained secretions might give rise to septic symptoms; furthermore, no matter how exact our asepsis, an error in technique may creep in, and, if local sepsis should develop, we want above all things free external drainage, in order to avoid, as far as possible, extension to the Fallopian tubes. This drain, therefore, is prophylactic in its aim. It can do no harm, and it may be the means of preventing serious damage.

The steps detailed will often answer for the induction of abortion and for its completion in the average case under the fourth month. Occasionally, however, the cervix is rigid, and then the steel-branched dilator and the finger cannot secure ample-enough dilatation. In such an event many practitioners resort to tents; but for the reason already stated and again emphasized, that the sponge tent cannot be rendered aseptic, we emphatically condemn this agent (including as well all other forms of tent), and we commend the following procedure: The external genitals having been rendered aseptic in the manner we have dwelt upon, the cervix is exposed through a speculum and steadied by a tenaculum. As much dilatation as possible is secured by the steel-branched dilator, and then the cervical canal and the lower uterine segment is packed by means of the intra-uterine dressing forceps with sterilized gauze. At the end of twelve hours the gauze may be removed, when, as a rule, the cervical canal will be found sufficiently patulous for the finger or else the cervical tissues have been sufficiently softened by the gauze to enable the steel-branched dilator to act efficiently. The further steps are similar to those already detailed.

There remain for consideration those instances where the cervical canal is not accessible to the dilator, owing, as a rule, to the marked retroflexion of the uterus with or without adhesions. It has been recommended, in such instances, to puncture the uterus through the rectum, the object being to tap the amniotic sac, which procedure will result in spontaneous abortion. This method should never be resorted to, owing to the absolute certainty of carrying products of infection into the uterus. The rectum cannot be asepticized as may the vagina. The aim of the method will be as well subserved by tapping through the vagina, care being taken to avoid any large vessels and also the ureteral triangle. Very rarely will such a step be necessary, however, and if resorted to the method must be called an uncertain one. In the face of an emergency suggesting it, it is wise to weigh the alternative step,—abdominal section, the breaking up of the adhesions, and reposition, per abdomen, of the uterus.

Artificial abortion, if performed aseptically, and if elected before the woman is at too low an ebb from the affection indicating the operation, ought not to have a mortality-rate. Hæmorrhage we may control; sepsis is avoidable by the steps of the operation we have advocated; shock need be feared only when the physician sees the patient too late or trusts to expectancy overlong. The after-treatment of cases where the physician has been called upon to induce abortion is similar to that which is applicable to the puerperium after delivery at term. The woman should remain in bed for about a week, not necessarily in the recumbent position, however. If there be no contra-indication from the side of the heart, and if the disease which called for the induction of abortion will permit, it is decidedly advantageous for the patient to sit up in bed, according to her fancy, for thus the vagina drains to better advantage.

If the operation has been performed aseptically, there will be no call for either vaginal or intra-uterine douching. Where a gauze drain has been inserted into the uterine cavity, it may be removed at the end of twenty-four hours; and if there be no evidence of local sepsis, it need not be re-inserted. If, notwithstanding all our aseptic precautions, sepsis develop, its surgical treatment will be in accordance with the rules to be emphasized in the chapter dealing with the surgery of the pathological puerperium.

## (*b*) The Induction of Premature Labor.

Obviously, the indications for the induction of abortion hold with equal, if not greater, case of the induction of premature labor. The object to be attained, however, is twofold. Both the interests of the fætus and of the woman are to be considered. Exceptionally, as will be noted, those of the former alone call for the operation. From the side of both the woman and of the child, the chief indications for the induction of premature labor are: 1. Contracted pelvis. 2. Hæmorrhage. 3. All toxæmias.

From the stand-point of the child alone the indication offers where, in a previous labor, the fœtus has died in a short time before term as a result, frequently, of disease of the placenta, such as fatty degeneration. Here, by electing premature labor in a succeeding pregnancy a few weeks before term, at a period when, from the decrease in fœtal movements, it may be inferred that death is imminent, the physician may thereby succeed in obtaining a living child.

1. *Induction of Premature Labor in Case of Deformity of the Pelvis.*—Deformity of the pelvis of varying grade is by far the most frequent indication for the induction of premature labor. The aim is a most beneficent one, seeing that the major obstetrical operations—the Cæsarean section, symphysiotomy, pubiotomy and embryotomy—are thus often avoided. As Robert Barnes, with a certain amount of truth, puts it, spontaneous labor may supersede the forceps, the forceps may supersede version, version craniotomy, and the Cæsarean section may be eliminated. Whether it is desirable or not that craniotomy should supersede the Cæsarean section will be considered later, as also the effect of the resuscitation of symphysiotomy and the newer pubiotomy.

In the instances under consideration, the problem for the physician to solve is most complex. He must determine as accurately as possible the term of gestation, in order to speak with any degree of authority in regard to the chances of viability of the child. He must estimate the probable size of the fœtus in relation to the degree of pelvic contraction in a given case. He must bear in mind the degree of molding to which the diameters of the fœtal head are susceptible within safe limits. He must, lastly, ever be conscious of the fact that in deferring the operation overlong in the interest of the child he may be increasing the risks which the woman runs. It is thus apparent how difficult it is to select just the right time for the induction of premature labor from an elective stand-point.

The determination of the stage of gestation so as to insure fœtal viability is not a simple matter. In almost every instance there is likely to be a margin of error of at least a fortnight. Where the exact date of the cessation of menstruation can be ascertained, the rule of adding seven days and counting back three months, in order to approximate the term of gestation, is exact enough only in the lesser grades of pelvic deformity; for here, if the error of a fortnight creep in, at best the child has not passed the seven and a half months of gestation. Where the interests of the child, on the other hand, demand the induction of premature labor at the seventh month, at least, the difficulty in determining this date might lead us to resort to the operation before the term of viability or else beyond it, when, in either event, the operation, so far as the child were concerned, would be a failure. The two hundred and twentieth day of gestation may be taken as the lowest limit when, with the improved means at our disposal (the *couveuse*, or incubator), a chance of the child being reared exists. Error in our data below this period may be taken as being fatal to the child. Not only, therefore, is it essential to obtain as accurately as possible the date of the cessation of the last menstruation, but also that of quickening. The first sensation of fœtal motion occurs from three to three and a half months after conception, in some cases not till the fourth month. Here, again, is a chance of error of a fortnight. But, by weighing the probable date of conception against the date of perception of fœtal motion, and comparing this with the height of the uterus above the pelvic brim, the physician is, at any rate, unlikely to err against the term of viability. It will be remembered, of course, that the general statement of the height of the uterus at various stages of gestation is subject to modification in the presence of a contracted pelvis. Whilst, normally, the fundus of the uterus is on a level with the umbilicus at the sixth month of gestation, and about two fingers' breadth above this at the seventh month, in case of contraction, chiefly at the pelvic brim, these relative situations will be a trifle higher. Thus, at the sixth month the fundus may occupy the position which normally it would at the seventh.

Having determined as accurately as possible the date of conception, the next factor is the estimation of the size of the fœtus which must pass through the given contracted pelvis. The size of the fœtus can, of course, only be relatively estimated. The best guide at our disposal is that furnished by Ahlfeld, and the value of this guide at best is very limited. From extended study, Ahlfeld concluded that the long axis of the fœtus lying flexed in the uterus is nearly half the entire length of the fœtus when extended. To determine the axis *in utero* of the fœtus, one arm of a pelvimeter is placed in the vagina in contact with the fœtal presenting part, and the other arm is placed on the abdomen at the site of the fundus over the other end of the fœtus. Multiplying the obtained measurement by two, the total length of the fœtus is obtained. According to Ahlfeld, the length of the extended fœtus bears a certain definite relation to the period of gestation. Thus: From the 38th to the 40th week of gestation the length of the intra-uterine fœtal axis varies from 9 $^3/_4$ inches to 10. The total length of the fœtus, therefore, is about 20 inches. From the 35th to the 38th week the intra-uterine axis varies between 8 $^3/_4$ and 9 $^3/_4$ inches. The length of the fœtus is 18 $^1/_4$ to 19 $^1/_2$ inches. From the 30th to the 35th week the intra-uterine length varies from 8 $^1/_4$ to 8 $^3/_4$ inches, and the total length of the fœtus is 16 to 18 inches. From the 25th to the 30th week the intra-uterine length varies from 7 to 8 $^1/_4$ inches, and the mean total length of the fœtus is about 15 inches.

Ahlfeld further determined that this length of the fœtus stood in the following relation to the weight:—

| | Weight. | Length. |
|---|---|---|
| At the 40th week | 6¼ pounds. | 19½ inches. |
| At the 38th week | 6½ pounds. | 19¼ inches. |
| At the 36th week | 6¼ pounds. | 18¾ inches. |
| At the 35th week | 6 pounds. | 17½ inches. |
| At the 34th week | 5½ pounds. | 17¼ inches. |
| At the 33d week | 4½ pounds. | 16¾ inches. |
| At the 30th week | 4¼ pounds. | 16¼ inches. |
| At the 28th week | 3½ pounds. | 15¾ inches. |

The data furnished by these researches of Ahlfeld, whilst only of approximate value in estimating the size of the fœtus, are still of great assistance in determining the period at which labor should be induced. An important factor lacking, however, is the average size of the fœtal head at various stages of gestation. The diameter of the fœtal head of the greatest importance is the biparietal. As the result of many measurements made by Budin, Tarnier, Stolz, and others, the average length of this diameter at various stages of gestation is: at term, about 3 $^{3}/_{4}$ inches; at 8 $^{1}/_{2}$ months, about 3.4 inches; at 8 months, about 3.2 inches; at 7 $^{1}/_{2}$ months, about 2.96 inches; at 7 months, about 2.75 inches.

The fœtal head, further, may be safely compressed to the extent of about 0.4 inch. Remembering this degree of safe compressibility, having estimated the size of the fœtus and the stage of gestation, the next important element in the problem is the determination of the degree of pelvic deformity present. Before passing, however, to renewed reference to this, we will state the method of estimating the adaptability of the fœtal presenting part to the pelvic canal which answers every purpose for private practice, and which commends itself, also, on account of its simplicity.

As long as the fœtal presenting part can enter the pelvic brim, obviously the time for the induction of premature labor may be deferred; but just as soon as the presenting part engages with difficulty, the time is ripe for interference.

Every week, therefore, the physician should examine his patient for the purpose of determining the above fact. Introducing one or more fingers into the vagina, he presses the fundus of the uterus downward in the axis of the pelvic inlet and the fingers in the vagina are able to appreciate the ease with which the presenting part adapts itself to the pelvic brim. If need be, the patient should be examined under anæsthesia. (See Fig. 2, Plate XXXIII.)

By reference to the chapter relating to "Pelvimetry" the method of determining the pelvic diameters and the characteristics of the chief varieties of pelvic contraction will be recalled. Taking the length of the conjugate of the brim as our guide, seeing that it is the internal diameter of the pelvis which alone can be determined with any degree of accuracy, and remembering that in a given case the capacity of the pelvis may be approximately estimated best by examination by the entire hand under anæsthesia, we may, with Charpentier, formulate the following general rules, which are the result of an extended study of the reports of numerous maternities and clinics:—

If the conjugate is at least $3\,{}^{1}/_{2}$ inches, the biparietal diameter of the fœtal head at term being $3\,{}^{3}/_{4}$ inches (compressible to the extent of about 0.4 inch), then, in multiparæ, labor should be induced between $8\,{}^{1}/_{4}$ to $8\,{}^{1}/_{2}$ months, according to the estimated size of the fœtus and the difficulty in delivery offered by former labors. In primiparæ, since, in general, the child is smaller, it is usually safe to wait a week before term. Where the conjugate is 3.35 inches premature labor—both in the multipara and in the primipara—should be induced at from 8 to $8\,{}^{1}/_{2}$ months. Where the conjugate is 3.12 inches, labor is to be induced between 8 and $8\,{}^{1}/_{2}$ months at least. Where the conjugate is 2.95 inches, labor is to be induced between $7\,{}^{1}/_{2}$ and 8 months. Where the conjugate is 2.75 inches, labor is to be induced between 7 months and 7 months and 3 weeks. Where the conjugate is $2\,{}^{1}/_{2}$ to 2.36 inches, labor must be induced as near the seventh month as practicable, and certainly not later than $7\,{}^{1}/_{2}$ months. Below 2.36 inches the indication for the induction of premature labor does not exist. To resort to it would necessarily entail an embryotomy, and this carries risk to the mother and subserves not the child. At this point, then, the indication for artificial abortion in contracted pelvis begins.

It is to be remembered that the figures just given hold good only for the fœtus estimated to be of the average size, and for a pelvis which ranks under the flat type, or, possibly, the generally-contracted type. The prognosis for the child is better, under the measurements given, if the pelvis be of the former variety than if it be of the latter. In general, of course, the special type of pelvis will alter the indication. All that we aim to do here is to state the general indications which serve as guides in the election of the period at which premature labor should be induced in the face of pelvic deformity. It is impossible to lay down special rules, since each case must be studied from its spécial stand-point.

2. *Hæmorrhage as an Indication for the Induction of Premature Labor.*—Hæmorrhage occurring after the fourth month of gestation should always awaken the suspicion of placenta prævia. There is little agreement amongst obstetrical writers as to the advisability of inducing premature labor on the appearance of the first hæmorrhage due to faulty implantation of the placenta. A careful study of this question, in the light chiefly of the more modern statistical data, warrants the following statements, which assist in reaching a conclusion sound in practice, seeing that it takes account of the interests both of the woman and the child. As has been noted under the subject of artificial abortion, in rare instances the hæmorrhage due to faulty insertion of the placenta occurs as early as the fifth month of gestation. As a rule, however, it is within the six weeks preceding term that hæmorrhage appears. Usually the first hæmorrhage is not profuse enough to endanger either the woman or the child. It may be taken, however, as nature's danger signal, warning the alert physician that a second hæmorrhage may at any time occur, and in such amount that not alone will the child probably die before delivery, but that the woman as well will be seriously endangered. Instances of this nature are extreme ones, but in no given case can it be predicted that such will not be the issue of the second hæmorrhage. Unquestionably, through en-

forced rest in bed, the woman may often be tided to term and delivery be safely accomplished for the child as well as for the woman; but even during the rest in bed profuse hæmorrhage may occur, and this too at a time when the physician may not be in ready reach of the woman. All authorities are agreed that the excessive maternal mortality of the past was due, in part, to faulty methods of treatment, in part to delay in resort to active measures. The maternal mortality has varied from 32 to 9 per cent. and the infantile from 50 to 85 per cent. The modern method of treatment has given a maternal mortality, in the hands of various observers, of from 1 to 4 per cent., whilst even the infantile mortality has been lowered. The facts, then, at our disposal prove clearly that by any and all methods the child suffers excessively, whilst for the woman there is a choice in method.

The question may be summed up as follows: The risk to the woman increases progressively to term after the first hæmorrhage. On the occurrence of this hæmorrhage the child is viable. Renewed hæmorrhage simply risks viability. The interests of the child, therefore, are not subserved by expectancy. Those of the woman are actually imperiled. The teaching is sound, therefore, which says: On the occurrence of the first hæmorrhage, whether profuse or not, elect the induction of premature labor. The earlier the hæmorrhage, the greater the chance of the placenta being implanted centrally. It is central implantation which at term subjects the woman to the greatest risks and holds out but very slim chance for the child.

3. *The Toxæmias as an Indication for the Induction of Premature Labor.*—Absolute statement in regard to this indication is not possible since there exists wide divergence amongst obstetricians. There even exists want of uniformity in regard to treatment when toxæmic symptoms are present. Under the old belief, when stress was laid on the presence of casts and of albumin, these were considered almost a constant forerunner and accompaniment of toxæmia. And yet the condition—of a fatal type, is met with when neither casts nor albumin are present. Modern views, amply

laid stress upon, take into consideration not alone albumin and casts, but also aceton, free acids, indican and free nitrogen.

In the presence of a toxæmia the question which the physician has to face, and which anxious husband and relatives will demand an answer to, is the immediate risk to woman and to child if gestation be allowed to continue to term, remembering that in no given case can it be predicted that the emptying of the uterus will ward off eclampsia or the symptoms of other toxæmia, and also that the interference with pregnancy may excite convulsions or intensify liver toxæmia. The problem is most complex, but the following considerations will help towards its solution.

In the vast majority of instances the development of eclampsia leads to premature labor. If we do not shut our eyes, then, to nature's teachings, it seems wise, in the presence of eclampsia, to resort to such measures as will hasten the emptying of the uterus instead of to such as will tend to protract the gestation. The latter course, certainly, will avail naught to the child, for its life is directly imperiled by the first eclampsic attack, and, should it survive this and labor not occur spontaneously, its chances of living through further attacks are all the less. As regards the woman, if spontaneous premature labor do not occur during the first attack, experience teaches that the liability to further attacks is greater if the uterus has not been emptied than where it has. The first attack exhausts the woman, if it do no more. The second attack adds to her exhaustion and may kill. Therefore, in the presence of eclampsia it may be stated that, in general, nothing is gained by endeavoring to protract gestation, and everything may be lost. One of the recognized methods of treatment of eclampsia is deep anæsthesia, protracted, if need be, for hours. During this anæsthesia resort to the measures we shall shortly consider will empty the uterus possibly of a live child, for at the period of gestation under consideration the child is viable; otherwise it becomes a question of artificial abortion,—a subject already considered.

Where convulsions are imminent, there is even greater diversity of opinion as to the advisability of inducing labor. Whilst apparently imminent, they may never occur; the induction of premature labor may not ward them off; indeed, the measures necessary for induction may provoke convulsions. In the face of this fair statement of fact, what ground is there for advocating the operation?

Supposing that, in spite of the recognized methods of treating the toxæmic factor—whether renal or liver or intestinal or all three, the symptoms progress, headache becomes worse, visual disturbances more pronounced, icterus more intense, and at the same time urea diminishes greatly and there is pronounced kidney insufficiency. It may be safely predicated that the chances are that this woman will have eclampsia before or at term, during labor or afterward. If she do before the onset or the completion of labor, the child's chances of survival are very slight. Meantime the woman risks aggravation in the renal symptoms and condition, disturbances of vision more or less permanent, puerperal mania, and puerperal paralysis. Now, if the operation of inducing premature labor be elected at the period under consideration, the child's chances are better even if, as the result of the manipulations, eclampsia is induced; for, as already stated, in the presence of eclampsia rapid emptying of the uterus is advisable. As for the woman, medical and dietetic treatment having failed to arrest the progress of albuminuria or the toxæmia (the usual forerunners of eclampsia), the induction of premature labor may save her the complications just enumerated, to any and all of which she is liable if the pregnancy is allowed to go to term. Should eclampsia develop as the result of the necessary manipulations, labor having been started, it may be more quickly ended than if emptying of the uterus is forced upon the physician by the spontaneous occurrence of convulsions.

In the presence of toxæmia emanating chiefly from the liver, it has been absolutely established that, where interference is postponed, the changes associated with acute yellow atrophy are apt to develop and then the golden opportunity has been lost for such instances are almost absolutely fatal. Therefore, when there exists suspicion of serious liver toxæmia impending the rule as to emptying the uterus is absolute else, and often notwithstanding, the issue is fatal.

As the case has been stated, therefore, the immediate and the remote welfare of the woman calls for the induction of premature labor in instances where the development of toxæmia is feared; and this fact should outweigh the argument, from the side of the child, that its chances of survival are less the earlier before term it is born, whether spontaneously or artificially. To be born in the midst or at the expiration of an eclampsic seizure at the eighth month or at term imperils its existence fully as much as, with our modern methods of rearing premature infants, its chances of survival are relatively great.

Modern opinion is tending toward the acceptance of this view. Lusk protested against postponing resort to the induction of premature labor until the grave symptoms (chiefly cerebral) which precede eclampsia develop. Tarnier, of the French school, held practically the same opinion. The opponents of this view are certainly many, and their names carry weight; but a careful estimate of the question, both from the stand-point of the woman and of the child, forces on us the conclusion that, dietetic and medicinal measures having failed to ameliorate the symptoms which precede eclampsia, or other toxæmic manifestations, the best interests of both are subserved by the election of premature labor.

Such, briefly outlined, are the indications for the induction of premature labor. In determining the best method for performing the operation, the fact must never be lost sight of that the intent of the operation will ordinarily be to save the woman the greater risk she suffers if allowed to go to term, and also to obtain a living child. To amply satisfy this intent in the individual case, the operation, where election is possible, should be postponed to as near term as is absolutely consistent with the interests of the mother, for thus the chances of the infant's life are increased. Further, the method selected should be one which, while the safest for the woman, takes into full account the phenomena of normal labor, since thus alone are the interests of the child fully subserved. Again, in view of the fact that the child has not attained full maturity, ample preparation should be made beforehand for the rearing of the immature child. Finally, the physician should be prepared to meet every emergency which labor at term might involve; for premature labor may call, before it is completed, for any of the obstetric operations (the forceps, version), and its completion may be followed by the same complications as labor at term (hæmorrhage, adherent placenta).

### METHODS FOR THE INDUCTION OF PREMATURE LABOR.

Many of the methods which have been proposed for the induction of premature labor are purely of interest from an historical stand-point. Such, for instance, is the administration of medicinal agents,—ergot, rue, quinine, cinnamon, and the like. These drugs will not provoke contractions, although some of them will intensify action when contractions are in force. Again, it has been suggested to start the expulsive action of the uterus by injecting water or air between the membranes and the uterine wall. Such a procedure would doubtless be effective, but should not be countenanced, since it is likely to rupture the membranes, thus imperiling the child, and since it may prove fatal to the woman from the entrance of air into the uterine veins. Vaginal irrigation with hot water is slow and uncertain in action, and, if prolonged, may give rise to local congestion, unfavorable alike to woman and fœtus. As will be noted, this method, within limits, is useful as preparatory to other methods, in that by means of it softening of the cervix may be assisted. Electricity is of value only as an adjuvant for hastening labor through re-enforcing contractions when these have once been started. Used alone, this agent is very problematical in effect, and highly uncertain as well.

There are left for consideration the following five methods: 1. Puncture of the membranes. 2. Tamponing the vagina. 3. The injection of glycerin. 4. The insertion of an elastic bougie between the membranes and the uterine wall. 5. Mechanical dilatation of the cervix.

1. *Puncture of the Membranes.*—This may be accomplished in two ways,—by direct puncture through the cervical canal; by insinuating a uterine sound on a sharpened goose-quill between the uterine wall and the membranes and tapping the membranes high up by projecting the quill over the stylet. This method was formerly highly in favor with the Vienna school.

Puncture of the membranes will certainly induce labor, and, where aseptically performed, the method may be ranked as safe for the woman. The method, however, is open to the objection that it does not imitate natural methods, and therefore may imperil the child. In the course of normal labor premature rupture of the membranes inevitably leads to tedious labor, and this may entail both maternal and fœtal exhaustion. Our aim should be to maintain the dilating water-wedge intact. This is the sound rule of practice in the course of spontaneous labor at term. Similarly, in case of the induction of premature labor, an operation resorted to in the interests of the child as well as in those of the woman, the object should be to maintain the membranes intact, in order to avoid a protracted first stage of labor, with its concomitant risks. Therefore, puncture of the membranes should be dismissed from consideration as a means of inducing premature labor.

2. *Tamponing the Vagina.*—Thorough tamponing of the vagina by means of aseptic tampons will unquestionably, in course of time, provoke uterine contractions, and the more speedily the nearer the woman is to term. The method, if aseptic throughout, carries with it no risk either to the woman or to the child, but it is slow in action. Days may elapse before effects on the uterus are noted. Now, when speaking of the indications under which the induction of premature labor was justifiable, we have noted that in pelvic contraction, for instance, it was highly important not to err in the date assigned for the operation, and that under the best possible conditions there existed a chance of error of at least a fortnight. Obviously, no method should be selected for the induction of premature labor which carries with it the strong probability of greatly magnifying the chance of error. The selection of such a

method is not fair to the child. Neither under other indications is it fair to the woman. If eclampsia threaten, for instance, and the physician determines that labor should be induced, he cannot afford to place dependence on a method which may not prove effective for days. There exists, indeed, but one indication under which the tampon might fill a place, and this is in the event of premature labor being indicated by hæmorrhage, due, likely enough, to faulty placental insertion. Here the tampon prevents further hæmorrhage whilst the cervix is dilating sufficiently to warrant resort to the next step in treatment. The colpeurynter of the late Karl Braun is an excellent agent for tamponing the vagina in such an instance, but it can never fill the place of the aseptic gauze, in private practice certainly, for the reason that it is made of rubber,—an agent which deteriorates with certainty in course of time, and can therefore not be depended upon as to quality. Further, it is not as strictly aseptic as sterilized gauze.

When the tampon is indicated it should be inserted under the strictest asepsis, and with the patient in the knee-chest or in the left lateral position, for thus alone can the vaginal fornices be efficiently packed. An iodoform or borated gauze inserted in a continuous strip forms the best tampon. If uterine contractions be not established within thirty hours the strip should be removed, the vagina douched with 2-per-cent. creolin solution or with 1 to 8000 solution of bichloride, and a new strip inserted, unless the cervix is found sufficiently dilated for resort to methods the aim of which is to empty the uterus rapidly.

3. *Injections of Glycerin for the Induction of Premature Labor.*—This method was formerly highly commended in Germany, but later researches should cause its rejection owing to the many instances of death occurring, owing to the disintegration of the blood traced to the glycerin. Further objection is the risk run of rupturing the membranes during the introduction of the catheter through which the glycerin is injected. Again, nephritis is likely to be caused.

4. *The Insertion of an Elastic Bougie between the Membranes*

*and the Uterine Wall (Krause's Method).*—The method of inducing labor by the introduction of an elastic bougie between the membranes and the uterine wall is probably resorted to with greater frequency than any other. The bougie acts as a foreign body, and at a variable interval provokes uterine action with certainty. The method is safe for the woman, provided proper asepsis accompany the insertion of the instrument. There are weighty objections against it, however. In the first place the presence of the bougie in the uterus may not induce labor for some days, and exceptionally not at all, unless it be rotated in the uterus with the aim of separating to a degree the attachment of the membranes. When the induction of premature labor has been duly elected by the physician, nothing is gained by awaiting what in any case may prove the slow action of the bougie; and, for reasons already amply considered, delay may mean the loss of the child. Further, in introducing the bougie (a step not always easy of performance) the membranes may be ruptured, and this accident it is very desirable to avoid in the interest chiefly of the child and partly also of the woman. Rotation of the bougie within the uterus is objectionable: first, on account of the possibility of injuring the placenta, with resulting hæmorrhage (perhaps of the concealed type,—so fatal both to the woman and to the child), and, secondly, on account of the risk, again, of rupture of the membranes. Lastly, it is not a very easy matter to asepticize the bougie. Soaking in weak antiseptic solutions will not suffice, and soaking in strong will injure the bougie. The material of which the bougie is constructed forbids its subjection to the most reliable method of obtaining asepsis,—exposure to dry heat. It is evident, therefore, that this method is not an ideal one; whilst we describe it in deference to the opinion of many teachers, we do not recommend it.

*Technique of Krause's Method.*—The instruments requisite are a speculum (preferably the Sims), a steel-branched dilator, and a tenaculum. The external genitals having been thoroughly asepticized, the woman is placed in the left lateral position, and the cervix is exposed through the speculum. The tenaculum is inserted into the anterior lip of the cervix to steady the uterus, and the cervical canal is dilated to the extent of a half-inch by the steel-branched dilator. This step is requisite in order to enable the passage of the bougie with least risk of injuring the integrity of the membranes. The asepticized bougie is then carefully insinuated to the fundus, between the membranes and the uterine wall. A tampon of sterilized gauze is inserted into the vagina to keep the bougie from slipping from the uterus. The woman is put to bed and remains there until uterine contractions are evoked. In the event of these contractions not supervening within twenty-four hours, the bougie must be removed, the vagina douched with creolin solution, and, if the emergency is still not pressing, a second sterilized bougie is inserted. If uterine contractions have been evoked, then, if the emergency be not pressing, the progress of labor is left to nature. In the event of a complication arising calling for speedy delivery, the physician may resort to the method shortly to be described.

5. *Dilatation of the Cervix as a Means of Inducing Premature Labor.*—With this method as a working basis, labor may be induced and completed within fairly normal limits, with less risk to the woman and the child than by any other method. Under this heading, then, the operation for the induction of premature labor will be described.

The operation having been elected, ever—except in strict emergency—under the support of a consultant, the physician will ordinarily have ample time to thoroughly cleanse the intestinal canal by the administration of one or another laxative, or, failing sufficient time for this, the lower bowel, at any rate, should be emptied by a copious enema. Convalescence from any obstetrical operation is favored when the great emunctory of the system is neither clogged nor torpid. The bladder is emptied and the field of operation is carefully ascepticized as follows: The labia and vestibule are thoroughly washed with soap and water, and then with a 2-per-cent. creolin or with a 1 to 5000 sublimate solution. The vagina should neither be douched nor scrubbed since the lactic acid bacillus protects it. The physician, and whoever assists him, should scrub his hands with soap and water, and next immerse them in alcohol or else use the chlorinated soda.

The instruments necessary are the following: A Sims speculum, an intra-uterine forceps, a tenaculum, a steel-branched dilator. These are to be carefully disinfected beforehand, and at the time of use may be placed in sterilized water or in an antiseptic solution, according to the preference of the individual operator. About two yards of sterilized gauze, two inches in width, are also needed.

Such are the precautions which are strictly essential in order to guard the woman against her main risk,—septic infection. The bladder having been emptied, the woman is placed in the dorsal position, the cervix is exposed by retraction of the posterior vaginal wall through the speculum and the cervix is fixed by means of a tenaculum. In rare instances it may be necessary to dilate the cervical canal to the extent of half an inch before proceeding to the next step; this, however, will prove the exception beyond the seven and one-half months of gestation, owing to the softened condition of the cervical tissues at this period. The sterilized gauze is grasped by the packing forceps and carried into the cervix up to and not beyond the internal os. The cervical canal is thus progressively packed full, and the remainder of the gauze is utilized to tampon the upper vagina. The object of the gauze is twofold: it will in all probability excite uterine contractions, but, if it do not, it mechanically dilates the cervix to a sufficient degree to enable the next step to be resorted to. The patient is placed in bed, and, in the event of the presence of the gauze being painful, a suppository of two grains of codein may be inserted into the rectum. Within ten to twenty-four hours the gauze will probably excite contractions, with the greater certainty the nearer the woman is to term. The physician's duty now becomes expectant or active, according to the emergency which has demanded the induction of premature labor. In the event of the indication for rapidly terminating labor not being urgent, the gauze is removed, under aseptic precautions, and the labor may be allowed to progress toward its natural termination. The physician's duty is purely passive, even as it is during the progress of normal labor. This applies particularly to instances where labor is induced in the presence of a contracted pelvis, where the lapse of even twenty-four hours has no untoward effect on either the woman or the child. Here, until full dilatation of the cervix is secured, artificial aid is only called for under stringent indication from the side of the woman or the child, such as hæmorrhage or evidence of fœtal heart-failure. It is absolutely essential to maintain the integrity of the membranes, since, the cervix once dilated, the safety of the woman or of the child, or the degree of pelvic concontraction, may call for the deliberate election of version.

In the event of contractions not having been induced, if no emergency requiring specially active measures be present, the physician, under strict asepsis, may insert another strip of gauze; but if the indications be pressing, the cervical tissues have been dilated to a degree by the gauze, and have been softened so that it is possible to resort to the next step in the operation, which, in the vast majority of cases, will give the physician full control of the case.

The aim of the step to which we now pass is to secure full dilatation of the cervix, or, in any event, sufficient dilatation to enable the physician to resort to version, the conditions under the premises being still favorable for this operation. According to whether the indication for interference be urgent or not, the physician may elect one of two procedures,—the first, in case delay of a few hours seems allowable; the second, if delivery is necessary within as brief a space of time as is consistent with inflicting no damage on the cervix and lower uterine segment. Both measures entail mechanical dilatation of the cervix.

The first method consists in the use of Barnes's hydrostatic bags or their essential modification, McLean's bags; the second depends on the use of the hand, a method not highly favored because of the objectionable and erroneous term applied to it,—*accouchement forcé.*

The difference between Barnes's and McLean's bags is that the former has but one compartment, removal being necessitated for the insertion of progressively larger sizes. McLean's bag, on the other hand, has two compartments, so that when the cervical canal has been dilated to the full extent of one compartment the other may be brought into action without removal of the bag.

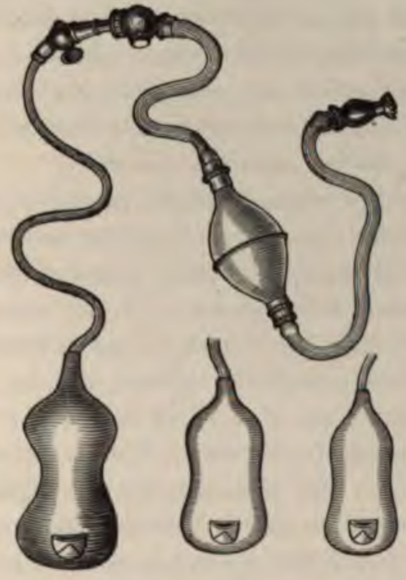


Fig. 49.—Barnes's bags.

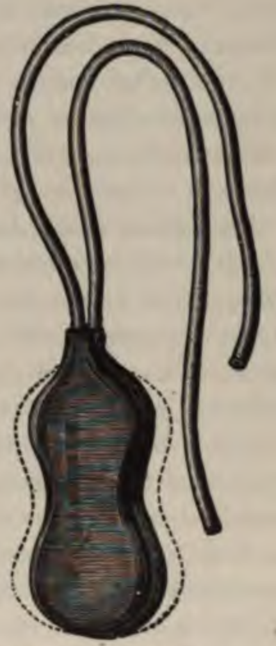


Fig. 50.—McLean's bag.

Of late years Voorhees and Pomeroy have given us bags of more useful form and of greater adaptibility.

The method of using these hydrostatic dilators is the following: The external genitals having been asepticized, and the bag and the forceps having been similarly treated, the bag is seized with the grasp of the forceps, and, under the guidance of one or two fingers in the vagina, it is inserted into the cervical canal just beyond the internal os. If uterine contractions are present the attempt at insertion should be made in the interval of the contractions, in order to avoid possible rupture of the membranes. The bag being in place, the forceps is withdrawn, the rubber tube of the bag is connected with a Davidson syringe, and the bag is distended with sterilized water. The object in using sterilized water is to avoid infecting the uterus, in case the bag should rupture. The rubber tube is then clamped and the patient is put to bed. Ordinarily, after the lapse of two hours, the cervical canal has been dilated to the full extent of the single compartment of the McLean bag, and the tube of the second compartment is connected with the syringe and similarly distended with sterilized water. In about an hour more the cervix has been sufficiently dilated to enable the physician to resort to delivery of the fœtus, preferably by version, if the integrity of the membranes has been maintained.

It is at once obvious that this method will not answer where the emergency requiring interference is urgent, as, for instance, in case of placenta prævia or eclampsia. Here time is an important factor, and a more rapid method is called for. Of late years a method of rapid dilatation, called by the French the *accouchement forcé*, has been resuscitated from unmerited oblivion, and in the presence of the emergencies just noted it offers the best aid to the woman, and also about the only hope for the child. The reason why the method fell into disuse and has been reprobated by obstetricians generally up to a comparatively recent date is because of the name which was applied to it. The fact is that absolutely no force need be used or is used in securing dilatation. The method depends for its success on the well-recognized fact that any muscle in the body will yield to continuously applied pressure. The procedure is, of course, tiresome to the operator, but the clinical results which may be secured through timely resort to it will amply compensate. The technique is the following: The woman being deeply anæsthetized, and the external genitals having been thoroughly asepticized, the hand is introduced into the vagina and the index finger is inserted into the cervical canal. Steady pressure is maintained, and shortly it will be found possible to insert the middle finger. Progressively thus finger after finger is inserted, until the entire hand has been introduced. The fist is then doubled and in a few minutes the remaining obstacle to dilatation will be found to yield and the physician can at once take the subsequent steps requisite for delivery.

We would again impress the fact that this method should be reserved for strict emergency. The risk the method subjects the woman to is laceration of the cervix, the rent from which might even extend into the lower uterine segment. This major accident should not, however, occur unless the cardinal rule is neglected, which is to use absolutely no force, but to cause the cervix to yield to the applied pressure. In the event of a laceration of the cervix occurring, the immediate operation on the cervix should be performed. This will be described in its proper place.

Both these methods—the use of the hydrostatic dilators as well as manual dilatation—evoke uterine contractions as well as dilate the cervical canal. These methods constitute at the present the ideal ones of inducing labor. They fulfill every requisite indication. They are aseptic. They start labor by the natural method, by evoking uterine contractions without the possible sacrifice of the child through premature rupture of the membranes; as a rule, they enable delivery to be effected within fairly normal limits. They necessitate, of course, the constant attention of the physician after the completion of the first step, the provoking of uterine contractions, but, as noted under indications, such attendance is requisite in order to fulfill strictly the aim of the operation, which is the safety both of the woman and the child. At any time it may become necessary to interfere actively in the interests of either. The first stage once completed, labor is ended spontaneously or by forceps or version, according to the individual case.

The above is the method which, according to our lights, best subserves the operation for the induction of premature labor. Latterly, Bossi has given us an instrument, called after him, the aim of which is to take the place of subsidiary primary methods of dilating the cervix, enabling the operator at once to proceed to delivery. The instrument consists of a very powerful multibranched steel dilator. It is introduced into the cervix, as is the ordinary steel-branched dilator, and, taking plenty of time and using the most gentle dilatation, the canal becomes obliterated sufficiently to enable the hand to complete the dilatation. In the hands of many experts, in this country and abroad, it would seem to fulfil its function, but, from experience, we deem it a very powerful engine capable of doing much harm and yet not accomplishing more, and even then in greater time, than the method we have described. Further still, in our hands it has proven capable of inflicting deep lesion on the lower uterine segment, even though applied carefully, and on these grounds we cannot commend it. Whenever the emergency is so stringent as to call for the immediate emptying of the uterus, and the vaginal portion of the cervix has not disappeared, we much prefer the vaginal Cæsarean section. This will be described in its proper place. (*Vide* subject of "Abdominal and Vaginal Cæsarean Section, Dührssen Operation.")

*Prognosis.*—The prognosis of the operation for the induction of premature labor obviously will vary according to the indication which requires it. If resorted to in the presence of eclampsia or placenta prævia, the result both for woman and child is necessarily more unfavorable than when, the emergency not being an extreme one, the physician has time at his disposal for the due election of each and every step. Everything, further, it should be reiterated, depends on the careful observance of strict asepsis. Whilst the prognosis should be guarded, in general it may be stated that the operation should not have a mortality-rate. Election of the operation and asepsis are the key-notes of success.

As regards the child, its chances of survival are the less the earlier the stage of gestation at which the operation is resorted to. Under the thirty-sixth week the infant can only be reared through the exercise of every possible care. In hospital practice, with modern appliances, it ought to be possible to save, at the thirty-sixth week (the ninth lunar month), fully 85 per cent. of the children. This has been accomplished by means of the incubator and forced feeding. At the Paris Maternity, 30 per cent. of children at the sixth month have been thus reared, 63.6 per cent. at seven months, and 85.7 per cent. at eight months. These figures refer to calendar months. In private practice, and particularly in country districts, it is not possible to always obtain an incubator, and the physician must do the best possible by means of an improvised incubator, such as an oven, the temperature being maintained at about 90° F. An inexpensive and portable incubator, so simple in construction that trained intellect is not necessary for its management, has been devised by Marx, of New York, and the hope is that before long every physician who contemplates the induction of premature labor will take steps to secure one in advance

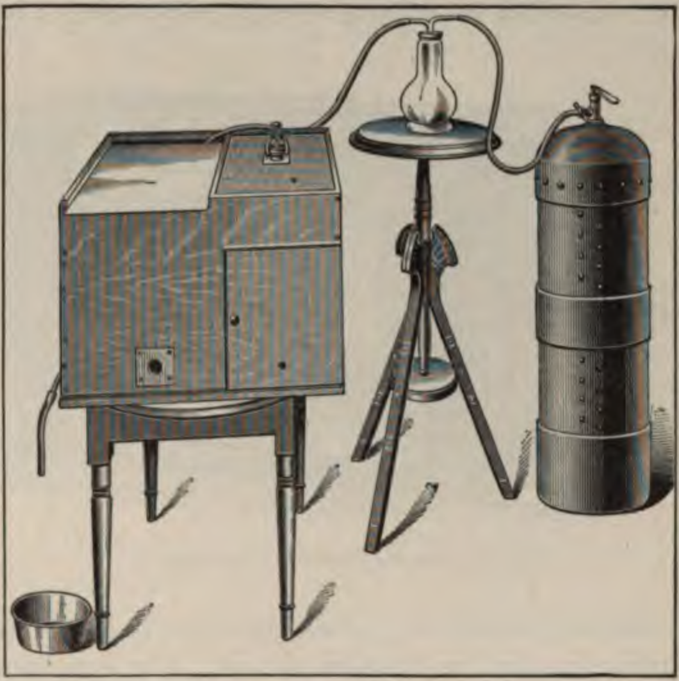


Fig. 51.—Marx's incubator (closed).

This incubator consists of a box made of well-seasoned hard wood, 21 inches long, 20 inches wide, and 14.4 inches high, lined throughout with sheet zinc, between which and the wood is a layer of sheet asbestos. It is divided by a partition into two unequal portions, one of which, slightly wider than the other, is the incubator proper, the other containing the heat-generating apparatus. This latter is a copper boiler of the capacity of one quart, resting on a tripod, underneath which is a Bunsen burner or an alcohol-lamp, which supplies heat to the water. Passing from the boiler through the partition and winding about the coils over the V-bottom of the incubator portion is a $^1/_4$-inch pipe about 10 feet in length, terminating in a free vent outside the box. The steam thus received in a suitable vessel, condenses and gives us an index of the condition of the boiler. The top of the boiler projects through the box and is closed by a metal cap, which unscrews so that the V-boiler may be readily replenished with water. In the incubator proper there is a well-padded basket suspended so that its bottom is about 5 inches above the coil of the steam-pipe. A glass plate sliding in grooves acts as a cover, which may be partially or entirely withdrawn to aid in the ventilation, which is supplied by numerous holes drilled in the walls of the box. A thermometer is

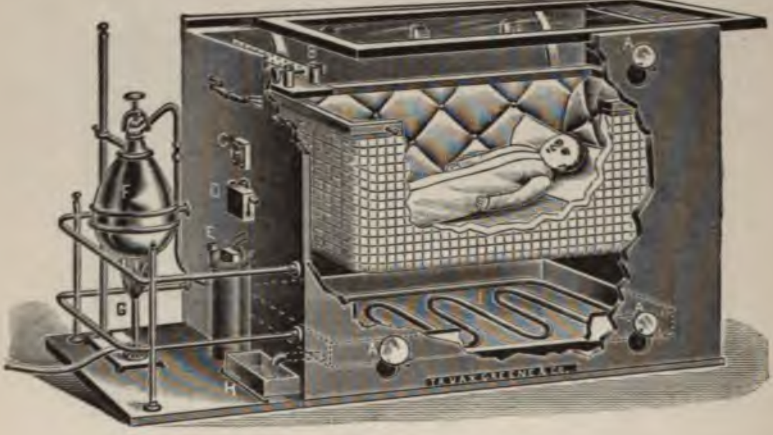


Fig. 52.—Marx's incubator (improved).

fastened horizontally to the top of the basket, immediately beneath the glass slide.

This simple apparatus commends itself on account of its relative cheapness, thus bringing it within the reach of even people of moderate means in whose families the operation of induction of premature labor becomes an operation of election. Marx has recently improved on the apparatus, but with the result of increased cost. A cheaper and as efficient device is one of the needs of the day.

# CHAPTER XIV.

## FORCEPS.

It is not intended here to enter into the history of the subject, nor to describe the various instruments and their modifications which are in general use. The special modification of the instrument is of very much less service than an accurate knowledge of its use. Recognizing the fact that traction is the essential power of forceps, it will appear that any instrument which is easily kept clean, easily adjusted to the child's head, and which is rigid enough to prevent slipping, will be the instrument which will meet the greatest number of requirements.

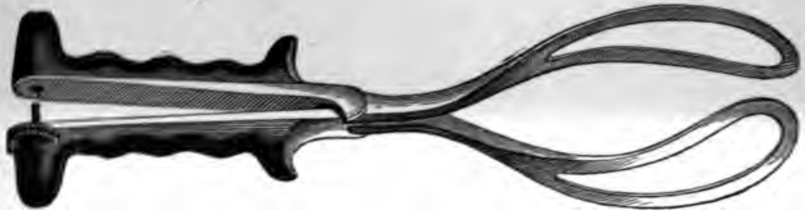


**Fig. 53.—Elliott's forceps.**

Numbers of instruments have been devised, which, though not perfect, will so nearly meet these requirements as to leave little to be desired. A forceps which is in very general use, and which is capable of being adapted to a large number of cases, is Elliott's (Fig. 53). This is a long, well-curved, and somewhat heavy instrument, which has an adjustable screw in the handle, by means of which the amount of pressure on the head can be regulated. While this is a convenience, it is no easy matter to keep the screw aseptic, and the same end may be gained by placing a folded towel between the handles of instruments not furnished with this attachment.

An instrument which is not in very general use, but which undoubtedly possesses merit, is known as Hunter's (Fig. 54). This instrument, having almost no handle, is grasped by means of a bar formed by the locking of the two blades. A firm purchase is attained in this way, and the hand is so near the head of the child that but little leverage force is possible. The shortness of the handles renders this forceps easy of application.

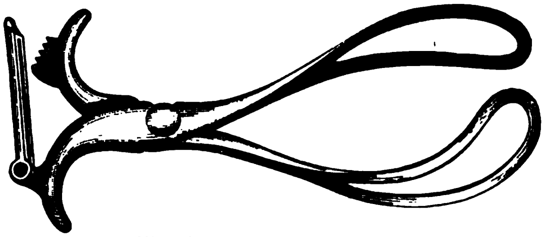


Fig. 54.—Hunter's forceps.

In addition to possessing some instrument which will meet the requirements mentioned, the operator who wishes to be prepared to meet emergencies must, of necessity, supply himself with some instrument which will permit him to make use of the principle of axis-traction. This can be found best, perhaps, in the instrument as devised by Tarnier and modified by Lusk (Fig. 55). The disadvantages of this instrument are that it is heavy and adds an amount of weight to the obstetric bag which is objectionable. It is some-

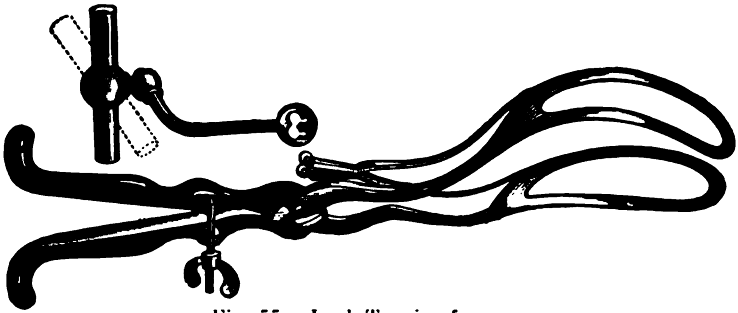


Fig. 55.—Lusk-Tarnier forceps.

what expensive, thus deterring some from supplying themselves with it. Objections of this nature, however, should finally yield to the established fact that in the high and median forceps application delivery is greatly facilitated through axis-traction, and, furthermore, less damage is likely to be inflicted on the maternal soft parts, provided the operator understand the use of the instrument and constantly appreciates its power. Outside of France the student is rarely trained in the use of the axis-traction instrument, and yet only by means of it can thoroughly-intelligent traction be made in the proper axis—that of the pelvic inlet. The traction-rods enable the operator to pull directly downward, and thus the presenting part is enabled often to enter the superior strait, whereas without the traction-rods it becomes blocked, as it were, at the inlet. Time and again forceps delivery from the pelvic brim is feasible

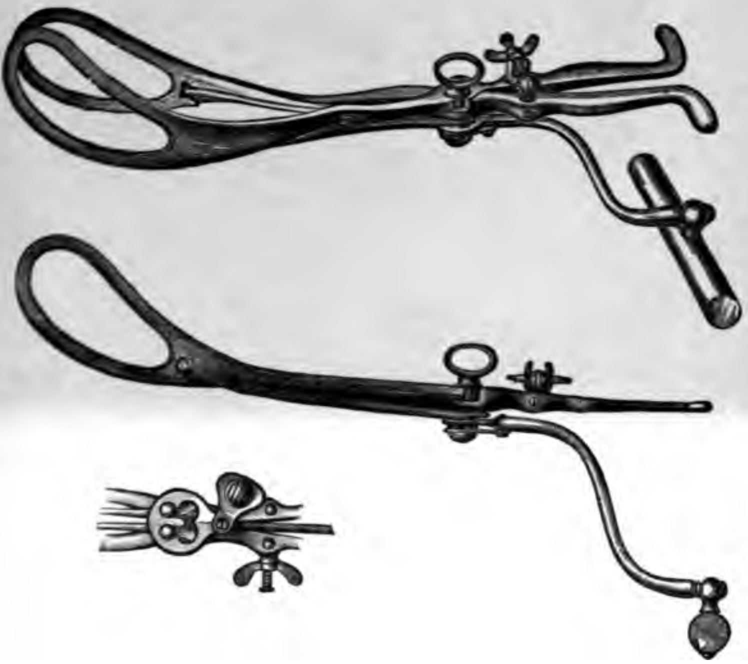


Fig. 56.—Jewett's axis-traction forceps.

when the axis-traction forceps is used where it would be impossible without the instrument. As will be noted later on, less tractile force is required because less is wasted, spontaneous rotation is favored, there is less bruising of the maternal parts, and less injurious compression of the fœtal head than are associated with any other form of forceps. And yet the instrument, used without accurate knowledge, is a dangerous one. Should the traction-rods not be kept in parallelism with the handles, the instrument is apt to slip and tear deeply the maternal parts; furthermore, the compressive force is greatly in excess of that of other forceps, and if this be not realized the fœtal head may suffer irreparable damage. The application of the axis-traction instrument differs in nowise from that of the simpler type of forceps, and since the traction-rods may be readily removed, the instrument is also of value in low applications. The latest model of this type of forceps does not possess the compression-screw, and this is a distinct advantage since the operator is unable to apply the powerful compression the earlier models yielded, an unnecessary compression in view of the fact that sufficient exists between the pelvic wall and the fœtal head.

Attempts at modification of the Tarnier forceps by means of traction-rods to be applied to any ordinary type of forceps have proved failures. No such substitute gives us an axis-tractor.

Traction is not the only force of which the forceps is capable, for compression and leverage are coincident to a greater or less degree.

In order that the forceps may not slip, a certain amount of compression is necessary when traction is being made. It is wise to remember this specially in those cases where the operation is prolonged, in order that injury may not result to the child. From time to time the instrument should be unlocked and the handles slightly separated, thus liberating the fœtal head. The forceps is not used for this compression force; it is simply an unfortunate condition, without which traction cannot be made Ordinarily, indeed, sufficient compression to prevent slipping results from the apposition of the blades to the pelvic wall. It is better that traction should be of an intermittent character, if for no other reason than that the head may be relieved of this necessary compression at least every two minutes.

Most authors hold that any form of leverage to be obtained by forceps is not only objectionable, but absolutely harmful. The use of the swinging or pendulum motion during traction may easily result in dangerous consequences to the mother, and should not be attempted. Without any doubt, a very slight up-and-down motion will facilitate the extraction; but it must be borne in mind that, at the same time, the free ends of the forceps may be ploughing into the maternal soft parts.

Direct traction is fraught with so little danger to the mother, and will so certainly be successful in those cases where the forceps is indicated, that it would be better never to resort to this pendulum motion. Instrumental rotation should not be attempted, for maternal injury is almost certain to result. However, it is necessary for the physician to bear in mind that if the forceps has been applied before rotation has taken place he must be careful not to prevent it by rigidly holding his instrument, but, when rotation is occurring, the forceps should be removed and reapplied.

*Indications.*—In a general way it may be said that inability of the mother's expulsive forces to overcome the obstacles to delivery is one of the most frequent indications.

Secondly, any cause which requires that the delivery should be accomplished rapidly, either in the interest of the mother or the child, provided, for other reasons, that the forceps is not contra-indicated, makes its application justifiable.

Forceps should not be applied to the hydrocephalic head, a decomposing fœtus, nor upon a perforated head. If applied to the hydrocephalic head or one that is decomposing, it will almost certainly fail to hold, and, even if successful, the end gained is not commensurate with the risk of injury to the mother. The perforated head can be better handled with a cephalotribe.

Forceps should not be applied until the os is three-quarters dilated or dilatable, nor until the membranes have ruptured and retracted. If the membranes have not retracted, there is the possibility that they may be grasped by the forceps and placental detachment occur.

The actual size of the os is of less importance than its dilatability. Forceps should not be applied until the elasticity of the cervix justifies the easy introduction of the blades, and even then it is preferable to complete the dilatation by the hand before inserting the blades.

There must be no mechanical obstruction on the part of the pelvic canal which will prevent the delivery of the child without unusual force. Carcinoma of the cervix, inasmuch as the cervix is rendered so friable, is a contra-indication to the application of forceps.

Forceps should not be applied where the fœtal head and the pelvic canal are so disproportionate that the probability of delivering a live child seems small.

Finally, forceps should not be applied until the head has engaged.

On the part of the fœtus, slowness or increased rapidity of the heart-beat or the discharge of meconium, where the presentation is other than a breech, constitute danger signals and call for forceps delivery preceded, where need exists, by manual dilatation of the cervix.

In regard to the time which should be allowed to elapse before the obstetrician resorts to instrumental delivery, it must be remembered that it is a question of conditions, and not minutes or hours. Undoubtedly many women would escape that condition of pelvic relaxation, which is so often seen, following tardy deliveries, if forceps were used before the muscles entering into the pelvic floor were paralyzed from overstretching. As soon as it is evident that the *vis a tergo* is not sufficient to overcome the resistance, then forceps should be applied. Another very safe rule to remember is: whenever the head fails to recede after a contraction of the uterus, forceps should be applied. The failure of the head to recede after a contraction shows that undue pressure is being made on the soft parts of the pelvic canal.

*Anæsthesia.*—Although it is probable that the extraction of the child with forceps is but slightly more painful than normal delivery, yet it is rarely justifiable to apply forceps until the patient is thoroughly under the influence of the anæsthetic. The danger which may result from some sudden motion on the part of the woman is greater than the danger of the anæsthetic, to say nothing of the increased ease of extraction on the part of the obstetrician. Chloroform is so much more rapid in its effects, and leaves so little to be desired as an anæsthetic, that it is preferable to ether. The patient should be anæsthetized to the surgical degree before the instrument is applied.

Many authors hold that the application of forceps is only justifiable in head presentations. Undoubtedly it will seldom be necessary to apply it to the breech, but there are conditions which will render the application of forceps to the full breech very advantageous.

It is absolutely necessary to make a correct diagnosis of the position of the child and the causation of the tardy natural delivery before the application of forceps. Before the examination is made which is to determine these points, it is better that the obstetrician have everything in readiness, so that no delay may occur. He should see that the usual heart stimulants are at hand. An hypodermic syringe and fluid extract of ergot should be in readiness. The instrument should be sterilized and placed in a basin containing 1 to 100 creolin solution.

Inasmuch as in forceps cases repeated digital examinations are made, it is wise to exercise unusual care in rendering the hands aseptic. They should be thoroughly scrubbed with soap and hot water, and afterwards *immersed* in sixty per cent. alcohol for five minutes and then in bichloride solution. The patient should be anæsthetized and turned across the bed so that the hips will extend well over its edge; the knees can be held by two assistants sitting on either side of the patient. The anæsthetic should be given into the hands of a physician who will have no other duty to attend to.

The external genitals must be carefully sterilized according to the method dwelt upon, but the vagina should not be interfered with since the lactic acid bacillus amply protects it against infection.

After palpating the abdomen, one hand should be passed into the vagina if the head is high, and with two fingers the operator should carefully palpate the fontanelles. If there be any doubt about their relation to the pelvic canal he should seek an ear, and finding it will enable the diagnosis to be made with certainty. At the same time he can determine if any obstruction on the part of the mother exists. The fœtal heart-sounds should be listened to, for their character will enable him to determine somewhat the effects of tardy delivery on the life of the child. The forceps is usually applied while the patient is on her back, though some prefer the left lateral posture. The bladder and rectum should be emptied before any operative procedure is undertaken.

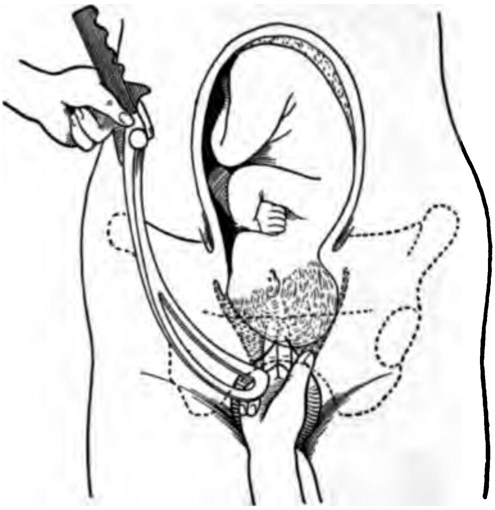


**Fig. 57.—Introduction of the left blade of the forceps.**

The operator, having assured himself of the exact position of the child's head, and that there are no contra-indications to delivery by the forceps, proceeds to apply it.

The blades, for purposes of designation, are known as right and left, corresponding to the right and left sides of the pelvic canal. The left blade should be introduced first on account of the method of locking. The left blade, grasped near the handle with the left hand, is introduced into the vagina (Plate XXXIV) and Fig. 57). Two or more fingers of the right hand passed into the vagina until the head is felt will serve as a guide to its introduction. The blade is made to glide along the palmar surface of the right hand and pass between the fingers of that hand and the head. It is necessary to remember the two curves of the forceps in introducing it. As the blade passes the fingers the handle is to be depressed and carried slightly outward. At no time must force be used in its introduction. If the blade cannot be made to easily adjust itself, it is better to withdraw it entirely and make another attempt.

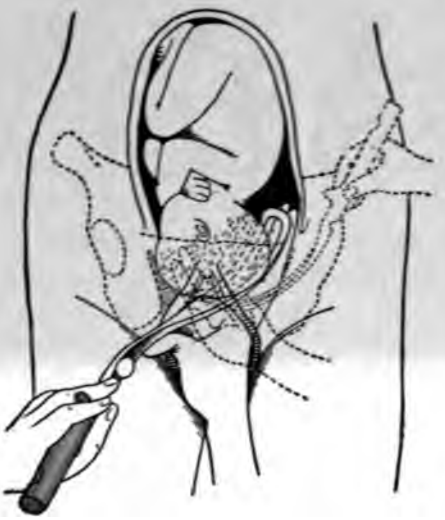
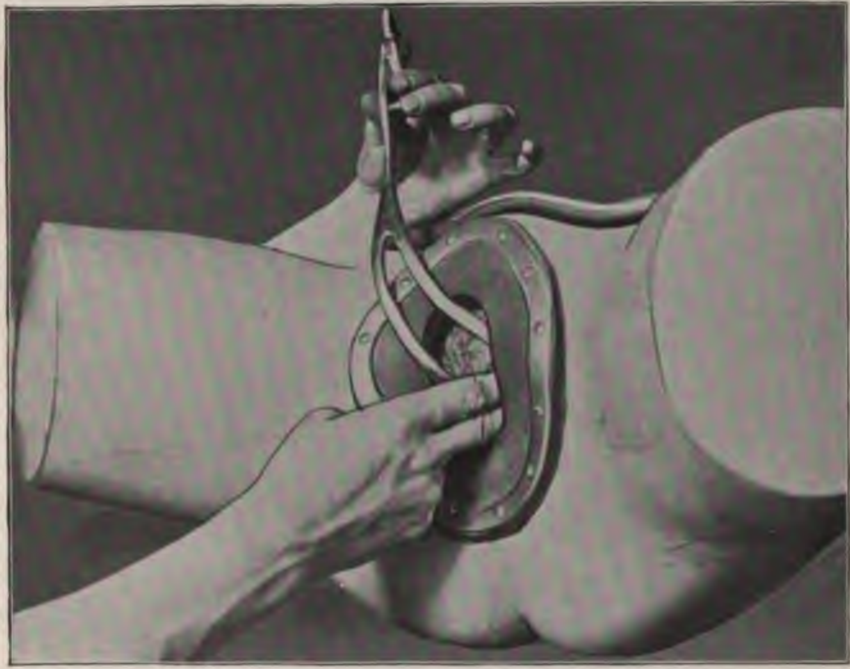


Fig. 58.—The left blade introduced; the right blade (in outline) ready to be introduced.

*PLATE XXXIV.*



*Introduction of the Left Blade of the Forceps.*

Force is so certain to do injury to the soft parts that it is never justifiable.

After the left blade has been introduced its handle should be given to an assistant, and the right blade introduced. Here the left hand acts as the guide and the right hand manages the blade (Fig. 58). No attempt should be made to introduce the blades during a contraction of the uterus.

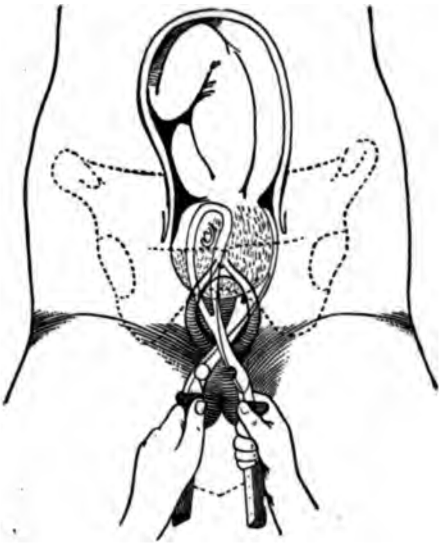


Fig. 59.—The forceps adjusted and ready to be locked.

It is customary to apply the blades first to the sides of the pelvis, irrespective of the position of the child's head, and afterward, if possible, to have them grasp the child's head in its biparietal diameter. As soon as the blades are passed and adjusted, they should be locked (Fig. 59). This is usually accomplished easily by slightly depressing both handles. Should this not accomplish the desired end they may be advanced or slightly withdrawn, and another attempt made to lock them. Forced locking must not be attempted. The very fact that the blades will not lock easily indicates that there is either faulty application or else the case is not one in which forceps should be used.

There is no operation which calls for more gentleness, judgment, and patience than the application of forceps. It is always necessary to bear in mind the possibility of including the mother's soft parts in the grasp of the forceps, and the injury which would result therefrom.

Forceps operations may be divided into low, median, and high applications. Again, whether the occiput is anterior or posterior, and whether the head is proportionate to the pelvic canal or not, must be taken into account.

*The Application of Low Forceps, Occipito-anterior Position, Head and Birth-canal Proportionate.*—This operation is the most simple of all forceps deliveries. It is indicated when for any reason it is an advantage to mother or child that the labor be terminated. These are the cases where non-interference so often results in injury to the mother's pelvic floor, the head remaining on the pelvic floor for so long a time that the levator ani muscle and the triangular ligaments are not able to regain their tonicity after the labor and their diaphragmatic action is impaired.

It must be borne in mind that the abdominal muscles play by far the greater part in the act of expelling the head from the vulva, and in women of poor muscular development or in those who have become thoroughly exhausted from a prolonged first stage the muscular force necessary to expel the head may be wanting. Many of these women would undoubtedly deliver themselves if left alone; but the question arises whether or not they will not suffer more injury, and of a more permanent character, if unaided, than could possibly result from the application of low forceps. It is not intended by this to mean that every woman should be delivered with forceps as soon as the head is low down, but simply as an opinion that many women are permanently injured by reason of an unnecessarily prolonged second stage.

Under strict aseptic precautions, as already mentioned, the blades are applied over the biparietal diameter of the child's head.

*PLATE XXXV.*

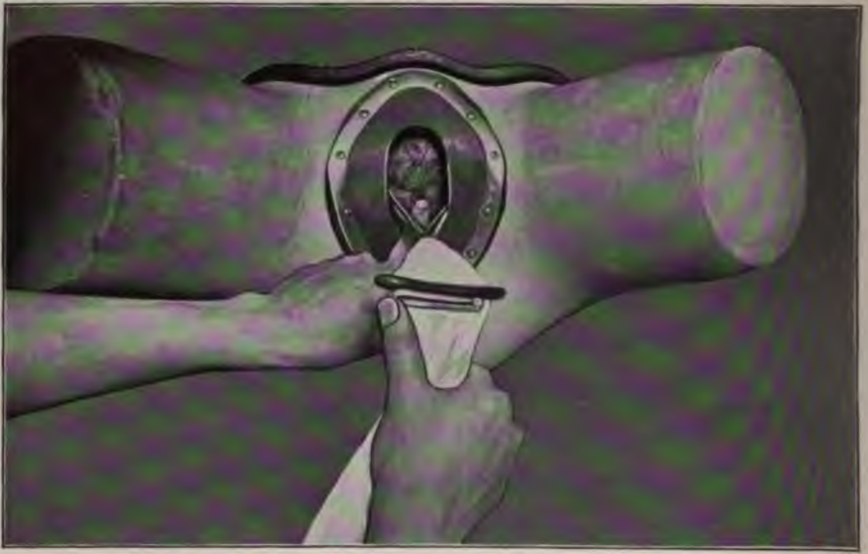


*Fig. 1.—Towel Applied to Handle of Hunter's Forceps.*

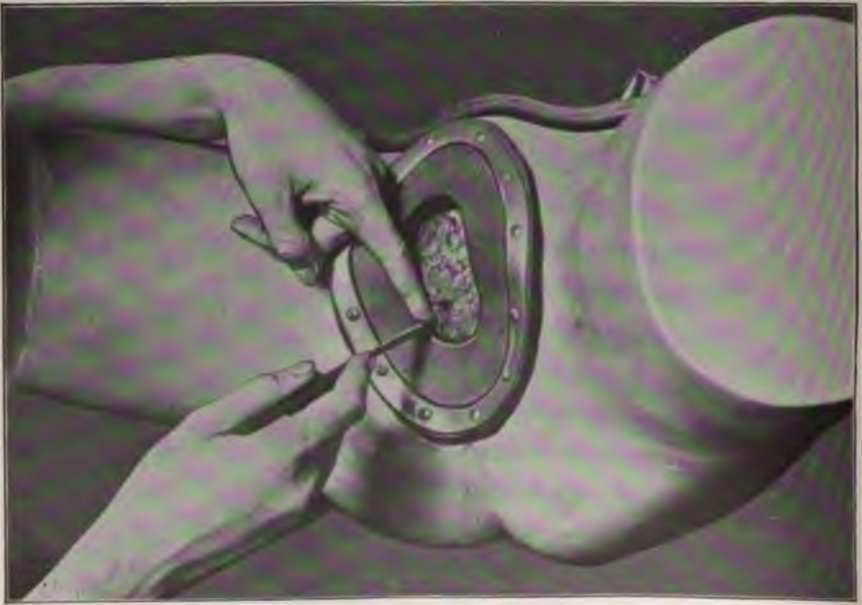


*Fig. 2.—Bilateral Incision of the Perineum (Episiotomy).*

As soon as locking has been accomplished, it is well to make tentative traction to see that the forceps has a firm grasp.

The instrument should be grasped with the right hand, with palmar surface downward. Should the instrument have transverse shoulders, the index and middle fingers should be placed over one shoulder and the remaining fingers over the other. In using Hunter's forceps it is often a relief to place a towel over the cross-bar and with the right hand to grasp the towel. (Plate XXXV, Fig. 1.) The left hand should be placed against the patient's buttocks, with one finger over the fourchette. This will enable the operator to determine just how much force he is exerting on the perineum. Traction should be made downward, or as nearly so as the perineum will permit, thus accentuating flexion (Fig. 60). Pendulum or swinging force during traction is contra-indicated. Firm traction exerted for not more than one minute will accomplish the extraction if persisted in. It should be the operator's attempt to imitate nature as nearly as possible in preparing the perineum for the delivery of the head. This can be done by allowing the head to recede after each traction. He should also release the grasp of the forceps slightly at each recession, that the brain may not be injured.

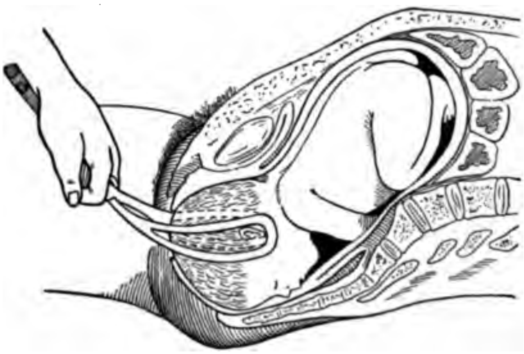


Fig. 60.—Showing the direction of the line of traction.

In the majority of cases calling for instrumental extraction pains are so infrequent that it is not wise for the operator to wait for the help which uterine contractions may give him, but he should make traction irrespective of their presence. Well-directed abdominal pressure on the part of an assistant will be of undoubted value. If it is evident that perineal laceration is impending, it is better to at once perform episiotomy. This little operation is no doubt worthy of more consideration than it has ever received. The measure is a simple one, consisting only in relieving the strain on the perineum by making a lateral incision on either side of the vulvar orifice. (Plate XXXV, Fig. 2.) The incision need not be more than an eighth of an inch in depth and half an inch long, extending up into the vagina. It is not likely that hæmorrhage of any consequence will result from this procedure, but, even if it should, a continuous catgut stitch will control it without difficulty.

As soon as the occiput is brought well down underneath the pubic arch, the forceps should be removed and the head delivered *between* pains, by introducing the finger into the rectum and, finding the chin, tilting it out over the perineum. This finger should always be protected by a rubber cot or better still a rubber glove should be worn. As soon as the head is delivered it should be held so that the shoulders may not be driven through the vulvar outlet during a pain; but as soon as the contraction, which is nearly always excited by the delivery of the head, has subsided, they may be lifted out as was the head.

*Low Forceps in Occipito-posterior Position, with Partial Rotation.*—It has been shown that firm uterine contractions, forcing the fœtus to travel over the inclined planes of the pelvis and resisted by a firm perineum, will cause the occiput to rotate forward. Should any of these factors be absent rotation may not be complete, and the fœtus will occupy an oblique position with occiput posterior. Usually, by giving the mother a rest, firm contractions will ensue and anterior rotation and normal delivery take place. It often happens, however, that in the interest of mother or child instrumental delivery becomes necessary.

After a very careful examination, so that the exact position of the occiput is made out, forceps should be applied in one of two ways: either directly to the sides of the pelvis or else in an oblique position.

The latter is more difficult, but is preferable on account of the lessened risks to the child. The forceps should be applied in that oblique diameter which is not occupied by the head. This will cause the blades to grasp the biparietal diameter of the head. The rule that the left blade should be introduced first should be disregarded here, unless it be at the same time the anterior blade, for this is the difficult one and should be first introduced. Unusual care must be taken to guard the mother's soft parts from injury. The forceps should be unlocked after each traction, which not only lessens the danger to the child, but also by releasing the head permits rotation to take place. At no time must instrumental rotation be attempted, nor, on the other hand, must natural rotation be prevented. Oftentimes it is wise to remove the forceps altogether and readjust it over the biparietal diameter, which may have changed its position. By patience and absence of any desire on the part of the operator to hasten the rotation, the head will often gradually mold itself, and under the tractions of the forceps, which acts as a re-inforcement to the expellant forces, rotate anteriorly.

If, after patient and gentle efforts, it be impossible to adjust the forceps over the biparietal diameter, it should be applied directly to the sides of the pelvis. The same care must be exercised here that the mother's soft tissues are not injured. It is also imperative that tractions should not be prolonged longer than a minute, and that the grasp of the forceps be relaxed between tractions. The child is put to such a disadvantage, even under these circumstances, that its life is often seriously jeopardized, and the operation is done primarily in the interest of the mother.

*Low Forceps in Occipito-posterior Position.*—It is the general opinion among obstetricians that few abnormalities produce a more difficult condition to terminate successfully than those cases where the occiput has rotated posteriorly and is wedged in the hollow of the sacrum. Fortunately these cases are not very frequent, for the child's condition is most perilous and injury to the mother's soft parts almost certain.

It is far better to delay the application of forceps in these cases as long as possible, so that, under continued uterine contractions, anterior rotation may occur. If, however, the mother is showing signs of exhaustion, or if the fœtal heart become feeble, then there is no other resort but to apply forceps. Delay beyond this point is not admissible.

The patient should be anæsthetized and the parts rendered aseptic, as before suggested. Carefully guarding the soft parts, the blades are applied to either side of the child's head. A moderate amount of pressure is necessary to prevent the blades slipping, but by relaxing the grasp frequently the injury to the child will be greatly lessened. As soon as the forehead is made to appear beneath the pubic arch it is well to remove the forceps, and, unless the reasons for immediate extraction are urgent, it is well to give nature a chance to rotate the occiput anteriorly. Otherwise, in place of making traction horizontally, as is necessary when bringing the forehead underneath the pubic arch, the handles should be lowered as far as the perineum will permit. This manœuvre will cause marked extension of the head and the forehead will be brought underneath the pubic rami. Forced extension now will cause the forehead to clear the pubes. The forceps should now be removed and, passing two fingers into the rectum, the head should be flexed until the occiput escapes over the perineum.

Laceration of the perineum will be almost certain to occur, and it should be repaired at once.

As already stated, these cases are among the most difficult ones found in obstetrics, and one of the hardest things to resist is the desire to attempt instrumental rotation. It will only be necessary to remember to what degree of injury to the pelvic floor this will subject the mother, to deter one from this procedure.

In these occipito-posterior positions the axis-traction forceps will be found of great value. By means of this instrument what

Marx has termed rotary axis traction may be applied without lesion to the maternal parts and yet, as a rule, with the result that the occiput rotates anteriorly in a large percentage of the cases. The blades, however, must be applied to the sides of the fœtal head and not to the sides of the pelvis. Then, whilst traction is being made gently, a rotary movement is exerted on the head in the direction which it is desired the head to rotate, that is to say, to the left in right posterior cases and inversely in left posterior. The same statements apply to face cases, taking the chin as the analogue of the occiput.

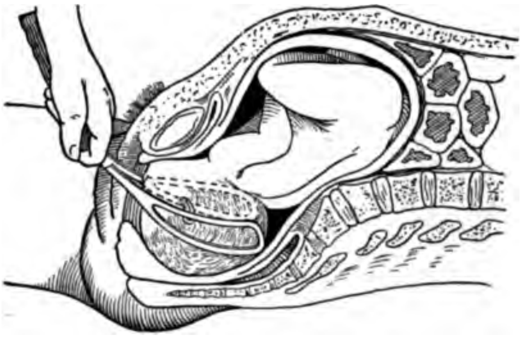


Fig. 61.—Showing direction of traction in face presentation.

*Low Forceps in Face Presentations.*—The application of forceps in face presentations, when that condition has not been diagnosed until after the face is well down in the pelvic canal, should be delayed as long as is consistent with the safety of the mother and child, in order that anterior rotation of the chin may occur. This rotation is nearly always tardy, and sometimes does not take place at all. Manual rotation of the head, if not too firmly wedged, is permissible and sometimes successful, but at no time should forceps be used to bring about this rotation. If the chin has rotated anteriorly, forceps should be applied directly to the sides of the child's head. A firm grasp must be taken and some compression used to prevent the blades slipping. Traction should be made horizontally until the chin is brought underneath the pubic arch, when the handles should be raised and the cranial vault and occiput lifted over the perineum. If the chin is turned posteriorly and the head is wedged in the pelvic outlet, there is so little probability that a living child can be extracted that it seems to be the part of conservative treatment to turn the attention entirely to the welfare of the mother and do craniotomy, or, in favorable cases, symphysiotomy.

*Forceps in Breech Presentations.*—Forceps should not be applied to the breech until after it has firmly engaged. When, however, the breech has entered the pelvic canal, and yet is too high to permit the finger passing over the groin or the application of the fillet, Tarnier's axis-traction forceps will be most advantageous. A dilated or dilatable os will render the operation so much more easy of success that this should be accomplished before the application of forceps. The majority of these cases are met in old primiparæ, where the parts are more than usually rigid, and the time spent in dilating the cervix will not be wasted. If rotation has occurred, the blades should be applied over the sacrum and posterior aspect of the thigh.

It is here that caution will be necessary to prevent the blades impinging so firmly on the parts that the child will be injured, and at the same time firmly enough so that they will not slip and injure the mother's soft parts. Hence it is better to make tentative traction at first, to see that the grasp is firm. The application of the principle of axis-traction to forceps enables the operator to use very much less force in the extraction, inasmuch as the resistance caused by the pressure of the presenting part against the anterior pelvic wall is very much lessened. Traction should be made only during a contraction of the uterus, unless the pains be too infrequent. If this should be the case, it is better to imitate the methods of nature and permit the recession of the breech after each traction. The rigidity of the canal will rapidly lessen under the influence of the advance of the breech, and the integrity of the soft parts will more likely be preserved.

If this intermittent traction is used, a very small amount of force will accomplish the delivery of the breech. Should the hips be transverse, it is better to attempt manual rotation first. If this is not possible, then the blades should be applied to the lateral surfaces of the thighs (Fig. 62). It is not expedient to allow the blades to embrace the crests of the ilia, inasmuch as the bones are too compressible and the forceps is almost certain to slip. In all cases well-directed pressure over the fundus will greatly facilitate the extraction.

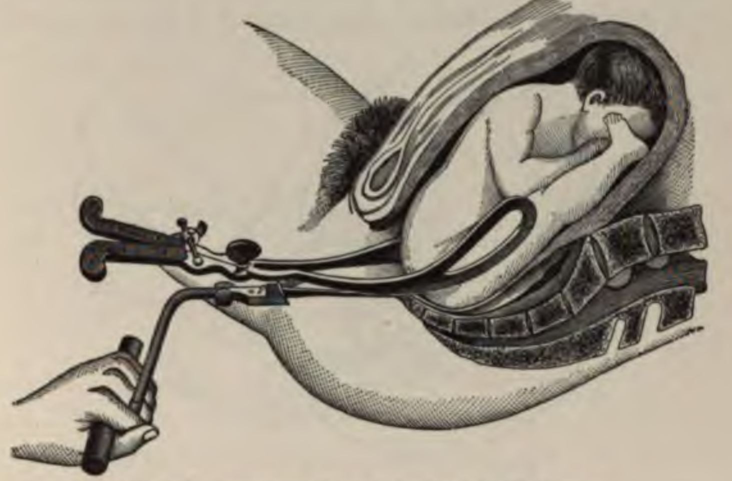


Fig. 62.—Tarnier forceps applied to the thighs.

*The Application of Median Forceps.*—Most authors refer to all forceps operations above the inferior strait as high forceps, and confuse in this way two very different operations. When the head has firmly engaged, indicating that its greatest diameter has entered the pelvic inlet, it seems better to consider it as being in a median position, and, should it become arrested there and necessitate extraction, to call the operation median forceps. This condition depends either on the disproportion of the head and the birth-canal or on lack of uterine force to overcome the resistance which is normally present.

This operation is fraught with far more danger than low forceps, for the blades of the instrument must of necessity enter the lower uterine segment, when the most extreme caution will be necessary to prevent injury to the uterus. Hence it is advisable to delay the application of forceps until instrumental delivery seems imperative to the mother or child, or both. If the undilated cervix is preventing the advancement of the head, it is far better to *manually* dilate it than to use the forceps as a dilating force, as is advised by many. Should cicatrization from any cause render the cervical tissue non-dilatable, the little procedure of nicking the cervical ring, as will be described in the chapter on "Version," will greatly facilitate the dilatation. This little operation should not be confounded with the Dührssen incisions, which are of greater magnitude and involve the lower uterine zone. (*Vide* Chapter on the "Cæsarean and Vaginal Section and Dührssen Operation.")

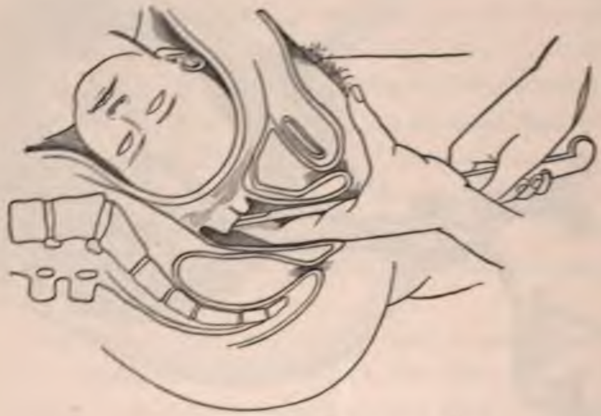


Fig. 63.—Incision of the cervix.

In incision of the cervix five or six shallow cuts are made through the hardened ring. This procedure is fraught with no danger to the child and less to the mother than when dilatation is accomplished by alternately drawing the head down and allowing it to recede. If the delay in advancement is due to lack of uterine force, this organ will often resume its energy if the patient is given a small dose of quinine,—grains 40. Should it become necessary, however, to apply forceps, the most strict aseptic precautions will be necessary. The patient should be completely anæsthetized and prepared, as has already been stated. The operator should be certain that the blades do not embrace any of the cervical tissue in their grasp. This can be prevented by recognizing the exact relation of the cervix to the child's head, and permitting the blade to enter the lower uterine segment between the fingers and the fœtal head.

Median forceps is usually applied directly to the sides of the pelvis (Fig. 64). Axis-traction forceps in these cases can certainly accomplish more with less force than any other instrument. Although, in the majority of cases, when the forceps is thus applied, it will be found that the blades have grasped the head in its oblique diameter, yet if the grasp of the forceps is frequently relaxed the injury to the child will not be great. As the head advances under the influence of axis-traction anterior rotation will probably occur, and the free mobility, which is insured by the handle of the traction rod, will permit this rotation more certainly than if the ordinary long forceps is used. Parallelism of the rods and handles must be maintained, and it is seen at a glance how much farther downward traction is exerted.

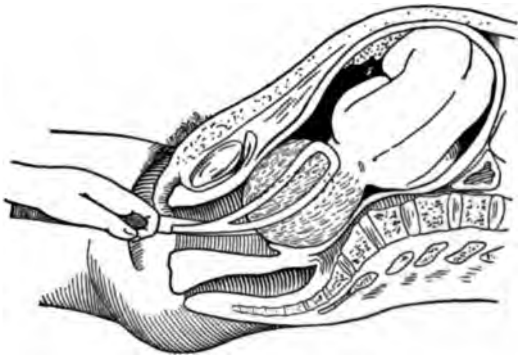


Fig. 64.—Application of median forceps.

As soon as the head has been brought down to the floor of the pelvis the traction-rods are removed and extraction is completed even as is described under "Low Forceps." If the axis-traction forceps be not at hand, and the ordinary forceps be used the operator must make traction as nearly downward as the perineum will permit, bearing in mind at the same time that the pelvic curve of the blades may be making undue pressure against the anterior aspect of the uterus. At the same time, if the handles are raised the presenting part will simply be forced against the symphysis and further advancement be prevented. Hence it will be necessary to exercise unusual patience, and at no time attempt to dislodge the head by the application of brute force.

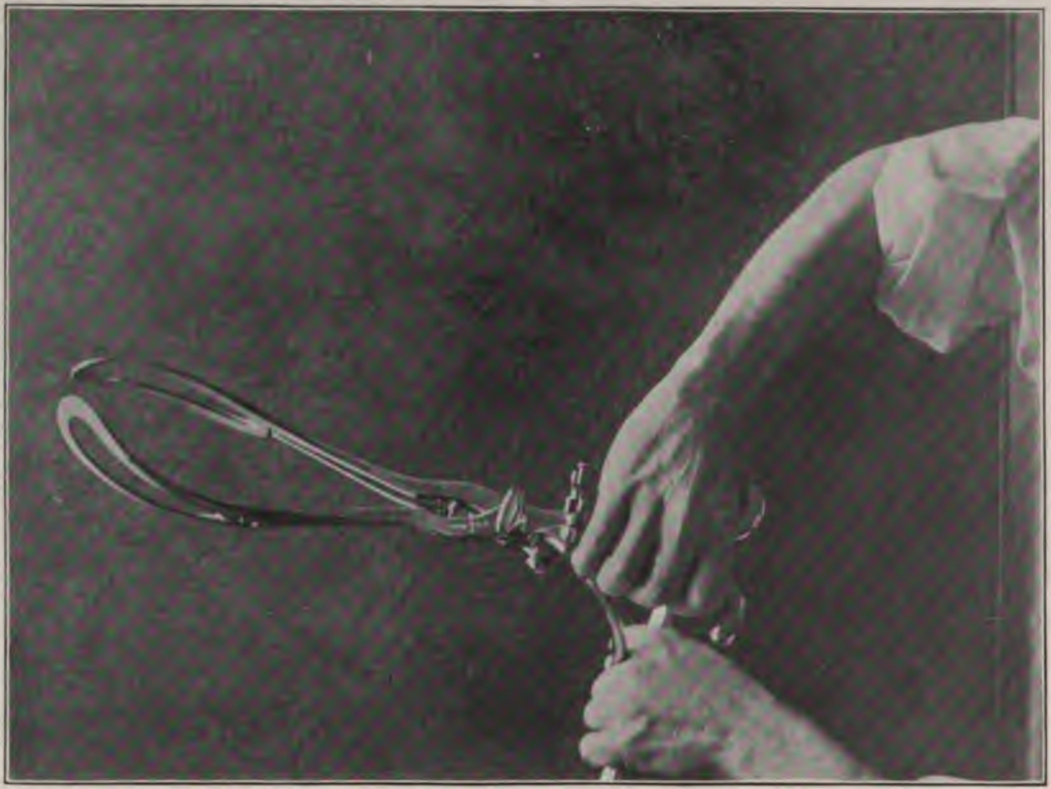
*High Forceps.*—It has already been stated that while the head is movable above the brim forceps should not be applied.

In rare cases where the waters have drained away and the uterus has firmly contracted around the fœtus, rendering version impossible, simply as a tentative measure forceps may be applied.

It is needless to say that the very greatest care must be taken, or else serious if not fatal injury to the mother will result. The patient should be thoroughly anæsthetized and the entire hand gently introduced into the vagina. It must be remembered that after uterine retraction has taken place the possibility of rupture is increased and no harsh measures must be adopted. It should be the aim of the obstetrician to determine, if possible, the cause of the failure of the head to engage. If it is due to contraction of the pelvis to any marked extent, it will be useless to attempt to drag the head into and through the pelvic canal. If the true conjugate is less than three and three-fourths inches, with a normally-developed fœtus at full term, forceps should not be used.

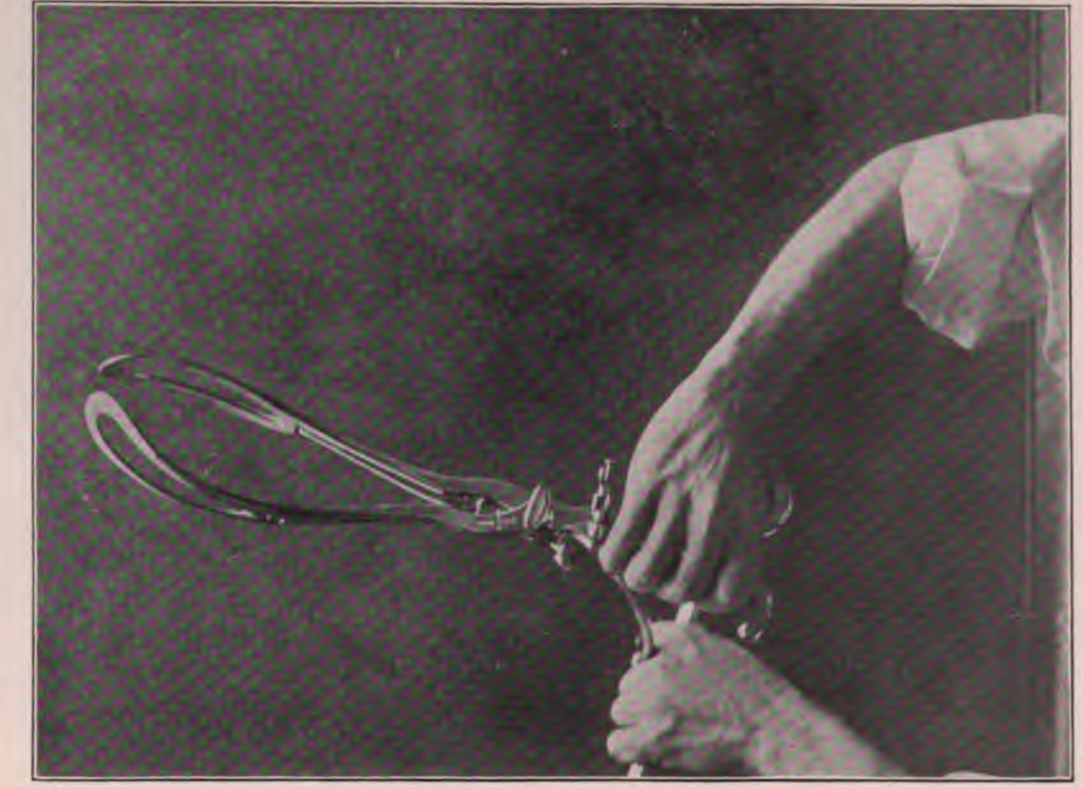
If upon examination the pelvic canal be normal, and it is found that early loss of waters has taken place and that uterine contractions have not been of normal force, then the forceps may be applied while the head is still above the brim if version be contra-indicated. As in median forceps, the cervix must be dilated before the forceps is applied. Carefully guarding the blade with the right

PLATE XXXVI.



*Position of the Hands in Performing Rotary Axis Traction.*

## PLATE XXXVI.



*Position of the Hands in Performing Rotary Axis Traction.*

or the child, on account of the prolonged compression of
is even more serious. Although the frequent unlocking
blades will afford a greater degree of safety to the child, its
fe not only is often jeopardized, but injury to the cranium may
sult in fatal convulsions or epilepsy. The more frequent use of
axis-traction instrument should modify this statement materi-
lly, because of the fact, upon which stress has been laid, that less
ractile force is requisite the nearer traction in the correct axis is
proximated.

# CHAPTER XV.

## VERSION.

THE term "version" applies to all operative methods for changing the relation between the long axis of the child and the long axis of the uterus.

Inasmuch as version is but another expression for turning, it also embraces the operation for converting an occipito-posterior position into an anterior one while the child is *in utero*, even though the long axes of the child and the uterus remain unchanged. By means of this operative interference the cephalic or pelvic pole may be caused to present. The breech may be changed for the head, the head for the breech, or a transverse either to the breech or head.

Again, as is stated above, the back of the child may be turned toward the abdomen of the mother. Before any operative procedure is performed it is absolutely necessary to determine the exact relationship which the child bears to the uterus; also the mechanical obstruction which is to be overcome, and an estimate of the comparative size of the child's head and the pelvic outlet must be secured.

Ordinarily this can be determined by abdominal palpation and vaginal examination, both of which methods should be resorted to. External palpation is a procedure too seldom used, and those who will accustom themselves to study every obstetrical case in this way will be surprised to see how soon experience will yield happy results. It is so very important to know just what position the child is in, that if, as is sometimes the case, it is impossible to gain the proper information from these two methods of examination, it is better to introduce the hand into the vagina and one or two fingers through the os. In this way a positive diagnosis can be made. At

other valuable information can be gained, viz., the
racter of the pulsation of the cord; the low implanta-
centa, if such be the case; the normal or abnormal
the sacral arch, and, in cases of slightly deformed
r or not one or both of the pubic rami encroach on
et. It is necessary to determine as nearly as possible
tions, or else there will be far too many cases of per-
e after-coming head, with the late realization that
one on which version should have been performed.
ch thorough examination calls for anæsthesia.

multiplication of terms is so prolific a source of confusion
dy of any subject, that it seems wise to reduce the nomen-
ure of version to such simplicity as is compatible with clearness.

Cephalic version indicates that some other position has been
nged so that the head presents.

Pelvic version indicates that some other position has been
anged so that the breech presents. Podalic version is a term which should be included under the head of pelvic version, inasmuch as it is but a farther step in that procedure.

Internal rotation of the child is the term which signifies that, while the long axis of the child bears the same relationship to the long axis of the uterus, the occiput has been made to undergo a half-rotation.

This changing of the fœtal relationship to the uterine may be accomplished in three ways: External, internal, or combined external and internal manipulation. Hence, to sum up this simplification of the nomenclature as applied to version, it may be taken for granted that all versions are either cephalic, pelvic, or consist in internal rotation of the child, and that the operation is performed either by external, internal, or combined external and internal manipulation.

Cephalic version has found a few advocates and, theoretically, should be performed in all breech or transverse presentations where no complications exist to contra-indicate such a procedure. Pinard, who perhaps has done more than any other to popularize cephalic version, intimates that any other than a head presentation is due to some abnormal accommodation between the head and the pelvic inlet. Granting this to be true, it would seem that this very fact would contra-indicate the operation. So rarely will the patient be able to deliver herself, even after the cephalic version has been performed, that the operation is not to be regarded as practical except in a very limited number of cases.

Almost the only condition which renders cephalic version practicable is transverse positions, where the waters have not escaped. The operation is contra-indicated in all cases where a rapid termination of the labor is indicated, when the child is not freely movable *in utero*, and in prolapse of the cord. Should the operation be determined upon in cases of transverse position, as indicated above, the combined method of Braxton-Hicks is far more likely to be successful than either the external or internal alone. Chloroform anæsthesia should be induced and the patient placed on a table which has been properly covered and protected. The operator and his assistant must exercise absolute care in cleansing their hands and arms. The patient's bladder should be emptied and a rectal enema given. The external genitals should be cleansed with soap and water by means of a brush and afterward douched with some antiseptic solution, such as bichloride-of-mercury solution 1 to 1000, or creolin solution 1 to 100. The prone lithotomy position will render the operation least difficult. The patient being in the condition of surgical anæsthesia, the operator proceeds to carefully palpate the abdomen and determine the position of the child. The operator now redisinfects his hand and, selecting the one which he most frequently uses in making vaginal examinations, introduces it into the vagina. If the os is dilated sufficiently to admit the first and second fingers, they are carefully passed through the cervix, using as little force as is possible, so that the membranes may not be ruptured. If the os is not dilated it will be necessary to gradually introduce one finger, and, as soon as possible, the second. By slowly separating the fingers as much as possible enough room can soon be gained so that the fingers can be passed into the utĕrus. Should a contraction of the uterus take place the operator must desist from any manipulation in order that the integrity of the membranes may not be endangered. The fingers now seek the presenting part, and if it be a shoulder it is gradually raised and pushed toward the breech. The assistant at the same time pushes the head toward the pelvic inlet, while with the other hand the operator governs the movements of the breech, and pushes it up toward the fundus. As soon as the head impinges on the vaginal fingers it may be made to settle into the brim of the pelvis. Carefully controlling the body of the child so that it may not again assume the transverse position, the membranes are ruptured and the water is allowed to escape. This permits the uterus to contract more firmly on the body of the child, and thus retains the head in its proper position. The remainder of the delivery may now be left to nature unless some further indication presents itself.

Pelvic version is, as already stated, the term applied to the operation of converting some other presentation into a breech. It is of no advantage unless the operator goes a step farther and brings down a foot, thus performing a podalic version. This operation, considered from an elective stand-point, and not as a measure of last resort, is capable of producing more favorable results than has ever been credited to it. It is not fair to charge this operation with fatal results to mother or child when it has been resorted to only after repeated vain attempts to deliver the child with forceps, or after the mother has become exhausted by her long-continued efforts to overcome a resistance greater than the force at her disposal. In the hands of one who recognizes the difficulties to be overcome, either at the beginning of the labor or soon afterward, it becomes a powerful measure in saving lives. Podalic version is indicated (1) in transverse presentations where the child is not freely movable, or when cephalic version is not indicated; (2) in head presentations where, from some complication, the head fails to engage; (3) in cases where it becomes necessary to expedite the delivery while the head is yet above the brim of the pelvis; (4) in head presentations where the safety of the mother or the child is likely to be endangered should the head be allowed to enter the pelvic canal.

The indication for podalic rather than cephalic version in transverse presentations will be found far more frequent, inasmuch as these cases are not always diagnosed in that stage of the labor which makes cephalic version possible. If the head is still above the brim of the pelvis and *movable*, podalic version is so much less dangerous than delivery by forceps that it should be adopted. Even in the hands of the most expert the application of high forceps is fraught with no small danger to the integrity of the soft parts of the mother.

In that class of cases where it becomes necessary to expedite the delivery, such as eclampsia, placenta prævia, accidental hæmorrhage, or pressure on the prolapsed cord, podalic version is the operation which yields the very best results.

The danger of allowing certain malpositions of head presentations to enter the pelvic canal is so well known and admitted that it needs but little more than be mentioned. In face presentations and in occipito-posterior positions which cannot be corrected by internal rotation, podalic version should be performed.

Podalic version is contra-indicated (1) when the cervix is not dilated or dilatable; (2) when the uterus is in tetanic spasm around the fœtus, the membranes having ruptured; (3) when the presenting part has become so firmly wedged into the pelvic inlet that undue force is necessary to push it upward; (4) in contracted pelves when the conjugate is less than three inches and three-quarters, and in oblique contractions when the brim of the pelvis is seriously encroached upon.

Operators who disregard the first contra-indication are the ones who will most frequently be compelled to perform craniotomy on the after-coming head which has been grasped in a partially-dilated cervix. This, of course, applies when extraction immediately follows version. The combined method permits version with but slight dilatation of the cervix.

When the uterus is in tetanic spasm around the fœtus the operation is fraught with so much danger that it is not advisable. Long-continued dry labors or the injudicious use of ergot is the most frequent cause of this condition, and rupture of the uterus is too possible an occurrence.

If the presenting part has become firmly impacted the force necessary to dislodge it will endanger the integrity of the soft parts so much that the operation is inadvisable, and some less dangerous method must be adopted.

Although it is easy to turn the child in cases where the pelvis is contracted, yet the delivery of a living child is so uncertain if the conjugate is less than three inches and three-quarters that there exists a contra-indication to podalic version. Perhaps one of the most frequent causes of failure in saving the life of the child in podalic version is the neglect on the part of the operator to take careful pelvic measurements. As the head of the fœtus is brought through the contracted inlet the Walcher position is to be assumed. (*Vide* Chapter on "Forceps.")

It is not necessary that the physician should leave his patient and seek a pelvimeter of some peculiar pattern, but it is essential that with his fingers he should form so nearly an exact idea of the true conjugate the he will be able to depend upon it. (The details for doing this have been given under the head of "Pelvimetry.")

In this, as in all other obstetric operations, it is absolutely necessary that an exact diagnosis should be made.

The operator must have a true mental picture of the position of the fœtus *in utero.* As stated under the head of cephalic version, external palpation and vaginal examination will, in most cases, render the diagnosis clear; but it is not infrequent, even in the most skilled hands, to make a mistake if these two methods alone are resorted to. If there is any doubt it is better to put the patient thoroughly under the influence of chloroform and introduce the *hand* into the vagina and two fingers into the uterus. In head presentations the ear becomes a most valuable landmark. If it is felt, it is with perfect ease that even one of no great experience can determine the position of the head. Let it be remembered that in but very few cases is there necessity for haste in making a careful examination. It is only after extraction begins that work must be rapid.

Before operating, the physician must have a *personal* knowledge that all the necessary preparations for the various emergencies which may arise are at hand.

Fluid extract of ergot and the usual restoratives,—whisky, strychnia tablets, etc.,—together with an hypodermic syringe in good working-order, should be in readiness. A perfectly clean, preferably new, gravity syringe, with an intra-uterine glass nozzle, should be filled with some mild antiseptic solution which is heated to 118° F. (Creolin solution 1 to 100 and bichloride-of-mercury solution 1 to 10,000 are as good as any.) Basins of hot and cold sterile water and a number of freshly-laundried towels should be in the room. Sterile gauze, for intra-uterine tamponade, should be cut in strips several yards long and two inches wide. Owing to the number of reported cases of toxæmia, iodoform gauze should not be used. A basin of some antiseptic solution and a new nail-brush should be in easy reach of the operator. A short-handled forceps, in case the after-coming head becomes arrested at the brim, should be sterilized. Needles, needle-holder, silk, silk-worm-gut ligatures, sponge-holders, and artery-clamps should be boiled and placed in a tray of sterilized water. The operator and his assistants must be conscientious in the details of antisepsis. If no operating-gown is at hand, a folded sheet can be made to take its place. The hands and nails are rendered clean with soap and brush and afterward by *immersion* in alcohol and next in 1 to 2000 bichloride.

The patient should be thoroughly anæsthetized and transferred from the bed to any ordinary table, which has been covered with a blanket and a piece of rubber sheeting. She should be placed on her back and the buttocks drawn well over the edge of the table. The knees are to be separated and drawn up over the abdomen. Confining the knees in this position by means of an improvised crutch made by tying one end of a sheet around one of the knees, passing the sheet back of the patient's head and tying the remaining knee with the other end of the sheet will necessitate fewer assistants.

The vulva and adjacent parts should be thoroughly cleansed with soap, water, and brush, and afterward with some antiseptic solution.

The catheter should be introduced, even though the patient may have recently passed her water. It is wise for the operator to inform his assistants exactly what duty is to be performed by each. It is possible to perform this operation simply with the help of one physician and a nurse, or some one who will act in that capacity; but it is far better to have the assistance of two physicians,—one whose sole duty it will be to administer the anæsthetic, and the other to assist directly in the operation. In regard to the hand which the operator should use in performing podalic version, it should be borne in mind that if an extremity is to be grasped the palmar surface of the hand must be turned toward the abdomen of the child. If the back of the child is to the left, the left hand is to be used; if to the right, the right hand must be used. From the variableness of the position of the child, the physician should attempt to educate both hands to an equal degree of tactile sensibility.

As has been stated previously, version may be performed by three methods,—external, internal, and the combined external and internal.

Pelvic version by the external method is so seldom applicable that little need be said of it. It is not often resorted to, owing to the fact that the substitution of a breech for a head presentation is scarcely ever a desired condition. It is not often practical, inasmuch as the great majority of the indications for version presupposes the indication for rapid delivery by bringing down a foot. In transverse presentations when the waters have not ruptured, and when the breech is nearer the pelvic brim than the head, it may be indicated. While it may be in its performance absolutely without danger to the mother, it must be remembered that it may put the cord to such a disadvantage that the child's life will be jeopardized.

If this method is decided upon, the patient should be placed upon her back with her knees drawn up so that the abdominal walls will be relaxed. The operator stands to the side of and facing the patient. The exact position of the child should be mapped out. The physician then places one hand over the buttocks and the other over the head of the child, and, by pulling the buttocks toward him and pushing the head up, he attempts to convert the position first into a transverse and then into a breech presentation. If the presentation is already a transverse, and the breech is nearer the brim, the head may be raised as the breech is forced into the pelvis. It is necessary that manipulations be made only during the *interim* between pains, and during the contractions of the uterus an attempt should be made only to retain the amount of advantage gained. This method presupposes relaxed abdominal walls, unruptured membranes, and free mobility of the child.

The combined method made so famous by the name of Braxton-Hicks, who perfected and popularized it, is likewise limited in its application, inasmuch as it is not often successful, unless the liquor amnii is still present or has only recently escaped, and where considerable mobility of the child is still present. It is seldom performed, since version is nearly always followed by immediate extraction, and this presupposes sufficient dilatation to admit of the entire hand being introduced into the uterus

In certain cases of placenta prævia where hæmorrhage is taking place before the cervix is very much dilated, the combined method is of great advantage. In such cases the prime object is to control the hæmorrhage, and if the operator can succeed in introducing even two fingers into the uterus he may be able to draw down a foot and thus plug the cervix with the buttocks. The operation is not easy or advisable if the head is wedged in the pelvis, nor when the uterus is contracted around the child. The patient should be thoroughly under the influence of the anæsthetic and the buttocks drawn over the edge of the table, as has been described.

rough asepsis on the part of the operator and his
of the external genitals of the patient, the entire
as previously been dipped into 1 to 100 creolin
orresponding to the position of the occiput, folded
e-shape, should be introduced into the vagina. All
to the hand should be gentle and at first directed

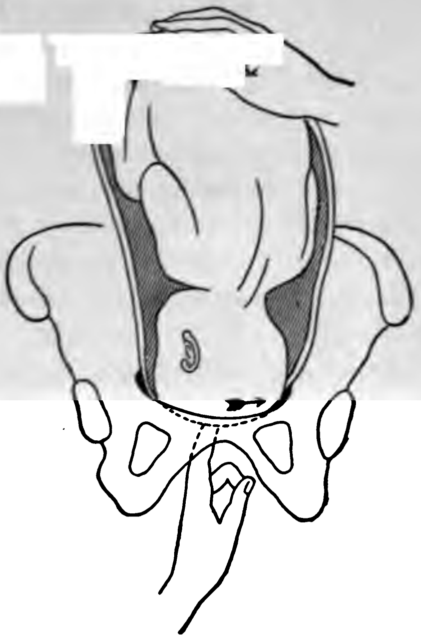


Fig. 65.—First stage of bipolar version.

downward and backward, then forward and upward, till the cervix is felt.

Counter-pressure with the unemployed hand can be made over the fundus of the uterus by the operator better than any skilled assistant can do it for him. This counter-pressure answers two purposes: the vaginal attachment to the uterus is not put on an undue amount of strain and the cervix is forced nearer the examining finger.

If one finger only can be introduced, proceed to dilate with the index finger (Fig. 65). As soon as two fingers can be introduced the head is sought and pushed up toward the side to which the occiput is directed, while with the other hand the buttocks are brought down in the opposite direction. If extension of the head has taken place the chest of the child will be felt, which should be pushed upward in the same way as in case the head is felt. As soon as the head is raised beyond the reach of the fingers the knees are sought, since they should now be within reach. The knee must be carefully distinguished from the elbow before traction is made upon it. There will be no difficulty in doing this if the operator remembers that the flexed elbow points toward the buttocks and the flexed knee points toward the head. It is not necessary to waste time looking for the patella; it is difficult to recognize, and the above rule is accurate. If the knee is felt, it should be grasped (Fig. 66) between the two fingers and brought still lower toward the brim; at the same time the other hand can now be used to push the head toward the fundus. As the knee is brought down the fingers can be

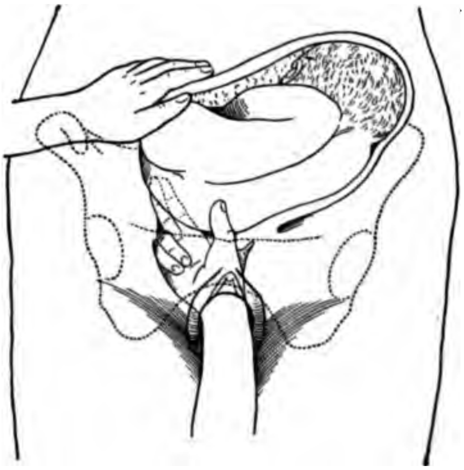


Fig. 66.—Grasping the knee.

wn the leg until the foot is grasped and extracted

es happens that the foot is felt before the knee;
n of the great toe and the malleoli will enable the
inguish the foot from the hand. If the foot is felt
it should be brought down, thus completing the

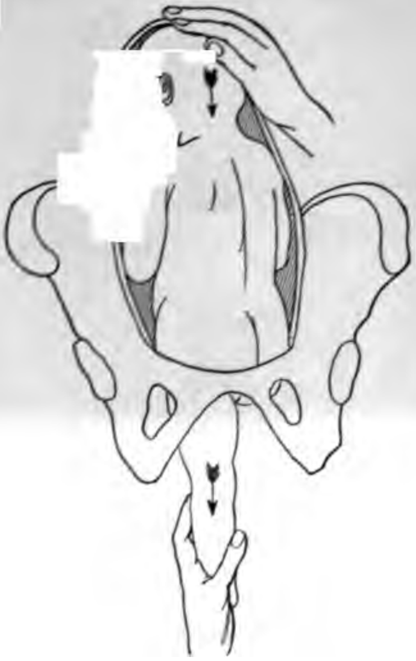


Fig. 67.—Representing first act of extraction.

It has already been said that the external method and the combined method of Braxton-Hicks are limited in their applications.

It is the internal method which has the broadest field of application, and which is of incalculable value in certain cases.

The indications and contra-indications have already been given. The position of the patient and the previous preparations are the same as in the external method. This operation should not be performed until the cervix is fully dilated or dilatable. Under thorough aseptic precautions the hand is introduced into the vagina very gently, until the cervix is reached. If the cervix is not dilated, its dilatation should be at once begun. By introducing one finger into the cervix it is easy to determine whether any constricting ring exists around the os. If such is found to be the case, it may be necessary, in case of urgency, to expedite the dilatation by using the knife (in Chapter relating to the "Cæsarean Section and the Dührssen Operation.") Until Dührssen advocated the method we describe it was the custom to make a number of superficial incisions, and these either did not assist in dilatation at all or else during delivery the incisions became tears extending often into the broad ligaments, and the resulting hæmorrhage required ligation of the uterine arteries.

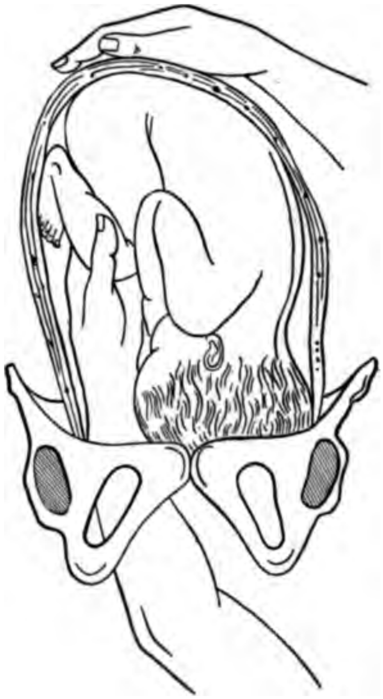


**Fig. 68.—Version in head presentation.**

It should be remembered that the emergency is rare where the Dührssen method is called for, since a cervical ring which will not yield to digital dilatation very uncommonly offers. During these steps—dilatation and, where necessary, incision—great care is requisite to avoid rupturing the membranes.

This procedure of manually dilating the cervix, while simple, is sometimes most trying on the operator's powers of endurance, and he may be forced to delegate a part of its performance to his assistant. The hand should be redisinfected with creolin solution 1 to 100, which at the same time takes the place of other lubricants, whenever there is occasion to introduce it into the vagina.

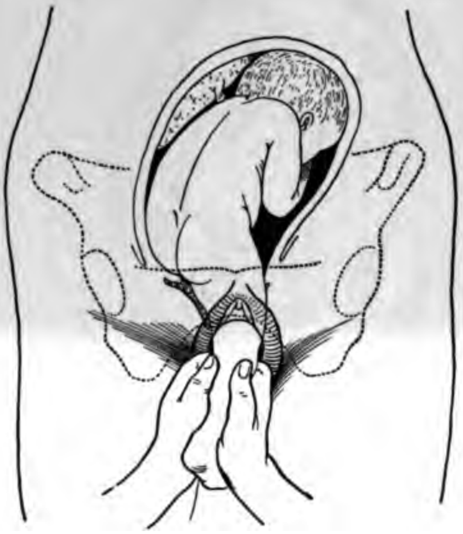


Fig. 69.—Completing the version.

When the os is fully dilated the operator should pass that hand which corresponds to the position of the occiput (right hand if the occiput is turned to the right) into the uterus, and move it upward until the neighborhood of the foot is reached. The membranes are then ruptured high up instead of at the level of the lower segment. The advantage gained is that more water remains, and this facilitates the version. The movements of the hand must be gentle and *between* pains. If a contraction of the uterus should take place, the hand must be flattened out and held perfectly still until it has subsided. The head is pushed to one side and a foot is sought, and as soon as it is recognized it should be grasped (Fig. 68). Before traction is made on the foot it is wise to note whether the cord is looped over the leg; if so, it must be released. While the cord is between the fingers its pulsations should be noted as regards their frequency and character, for this may give the operator additional reason for hastening the delivery.

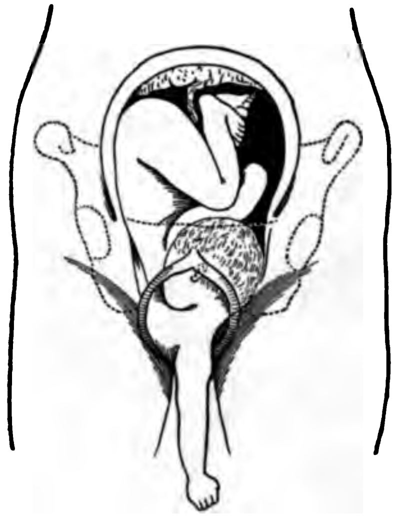


Fig. 70.—Impacted shoulder.

As the foot is drawn down the other hand is placed over the fundus and makes counter-pressure. It should be the duty of the assistant to govern the movements of the head, and as soon as the operator makes traction on the foot he should attempt to carry the head in the opposite direction.

As the operator draws the foot down into the vagina, the head ascends to the fundus and the version is completed (Fig. 69).

In transverse presentations, if there is no prolapse of the arm, the same method is to be adopted for performing version as has been described above, except that, as the head is already above the brim, a foot is sought at once.

In cases where the arm has prolapsed, but has not become impacted, it can be pushed up with but little difficulty. It is well, however, while the arm is still in reach, to fasten a loop of tape around the wrist before it is pushed up. This will be of assistance during the extraction, for, by drawing gently on the tape, at least that arm will be prevented from becoming extended.

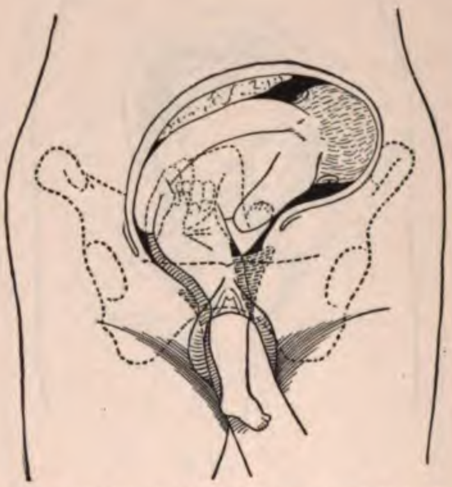
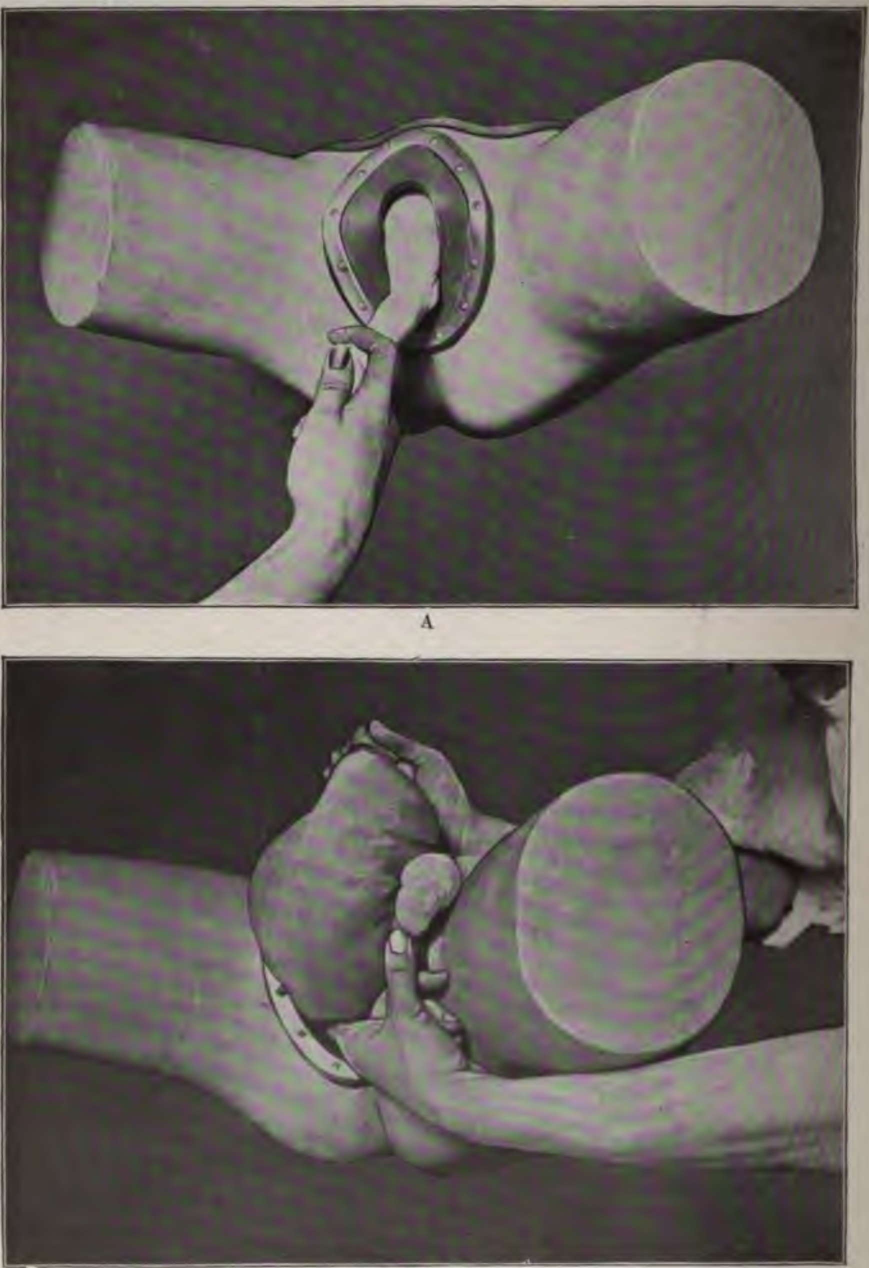


Fig. 71.—Introduction of the left hand to bring down the posterior (left) leg.

In those cases where the arm has become prolapsed and long-continued uterine contractions have taken place, the thorax may have become wedged into the pelvic outlet. It must be borne in mind that here it will be necessary to replace that part which last came down before the arm and shoulder can be replaced (Fig. 70). The thorax must be carried up above the brim before any attempt is made to replace the arm. This procedure requires the greatest care on the part of the physician, or else a ruptured uterus is almost certain to result. If, after making well-directed pressure from below with firm counter-pressure over the fundus, the impaction

PLATE XXXVII.



*A. Showing Method of Grasping the Foot.*
*B. Extracting the Posterior Arm*

cannot be relieved, it is better to discontinue the efforts to perform version, and either do embryotomy in the interest of the mother or, if the mother be in good condition and consents and the outlook for saving the child is not too poor, resort to symphysiotomy.

The indications for version almost always presuppose immediate delivery.

Much has been written on the subject: "Which foot should be drawn down?" If there is no immediate reason for haste and the operator has time to make his selection, it would seem that it is best to draw down that foot which is nearest the anterior surface of uterus. In actual work, however, it does not make much difference which foot is brought down. That one is usually best which can be soonest recognized and most firmly grasped (Plate XXXVII, A).

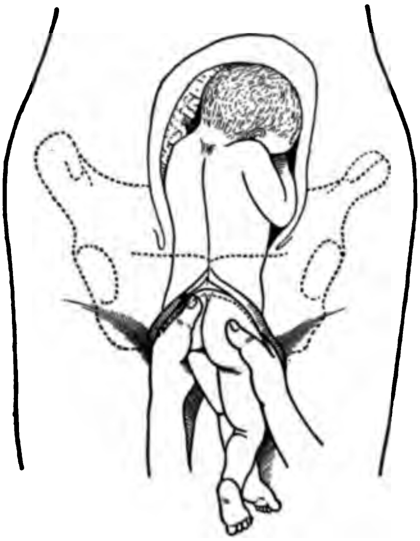


Fig. 72.—Showing direction of traction.

It is better, in primiparæ certainly, and often in multiparæ, that one foot only be brought down, for the cervix which has permitted a half-breech to escape will be less likely to grasp the after-coming head than if it has been dilated by the pelvis alone.

If, however, traction on one leg does not prove successful, it will be necessary to draw down the other (Fig. 71 and Plate XXXVIII). As the foot emerges from the vulva it is to be wrapped in a warm towel, which not only offers a better grasp on the part, but also tends to prevent the cool air of the room from causing enough reflex irritation to establish respiratory efforts on the part of the child. Soon the leg can be grasped in the same way, and at this time traction is to be made in the axis of the brim downward (Fig. 72).

It is very necessary that during the entire process of extraction the assistant should make pressure in the proper axis on the child's head. This tends to prevent extension of the head and also furnishes the *vis a tergo* which the patient, by reason of the deep anæsthesia, cannot give.

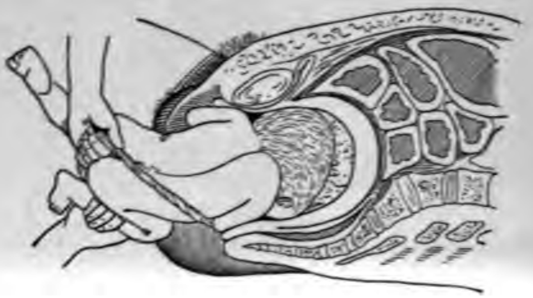
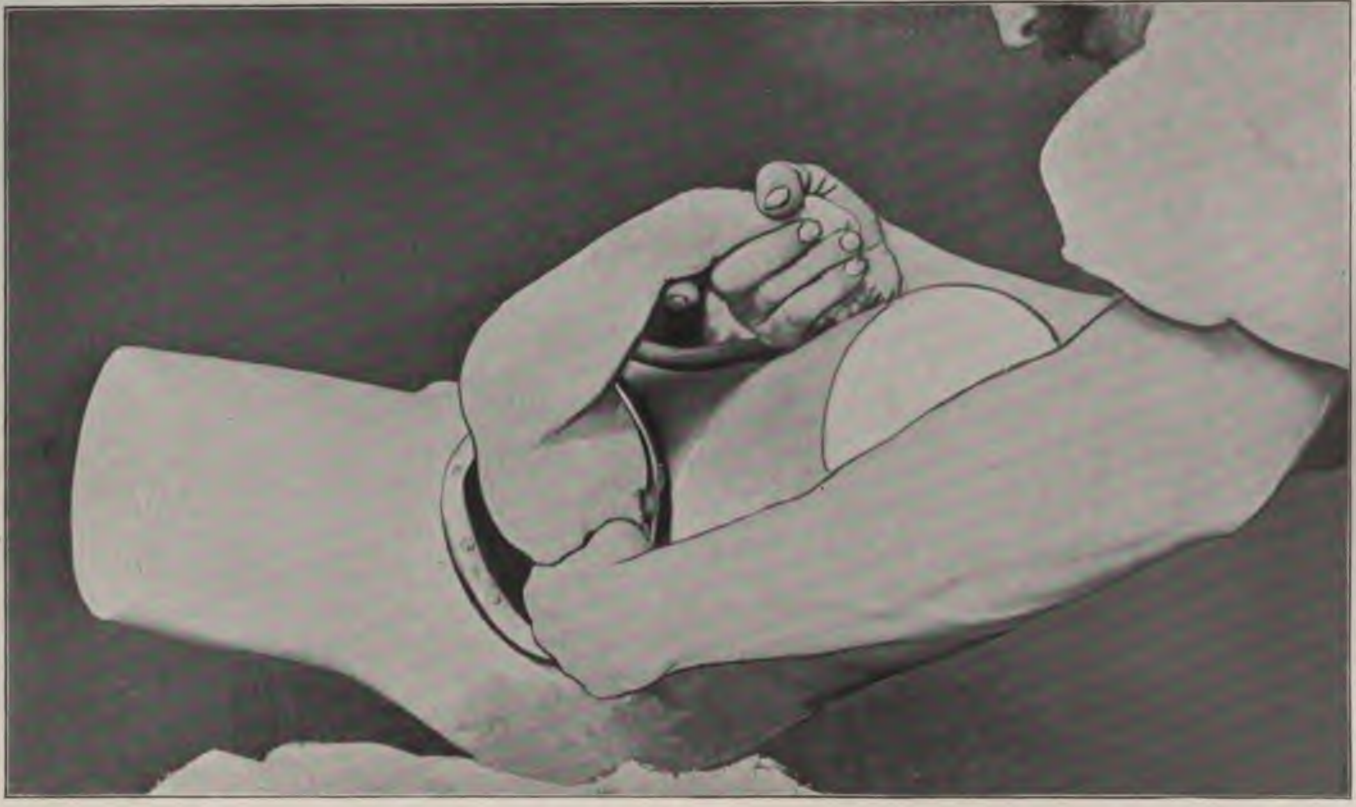


Fig. 73.—Method of releasing the cord.

As the buttocks emerge from the vulva, one finger of the hand corresponding to the flexed thigh should be hooked into the groin; this will enable the operator to lessen the traction on the extended leg, and at the same time permit him to exert greater tractile force. By raising the buttocks and making traction upward the flexed thigh can be made to clear the vulva. The pelvis should now be grasped with both hands and drawn downward—again in the axis of the brim.

As the cord comes down it is to be drawn upon from the *placental* side, and if it is over one of the legs it must be released

PLATE XXXVIII.



*Extracting the Posterior Leg*

(Fig. 73) and placed in the position where it will be subject to least pressure. In rare instances it will be impossible to draw the cord down without making undue traction. If such should prove to be the case, it should be secured by means of two artery-clamps and cut. Of course, if this be done, it will be necessary to hasten the delivery as much as possible.

When the scapulæ appear the arms must be liberated before extraction is continued. Under favorable circumstances—that is, if the assistant has kept up intelligent pressure on the fundus, or if the cervix was fully dilated previous to the version, or if the operator has not made traction in too rapid a manner—the arms will be folded on the chest and their extraction will be easy.

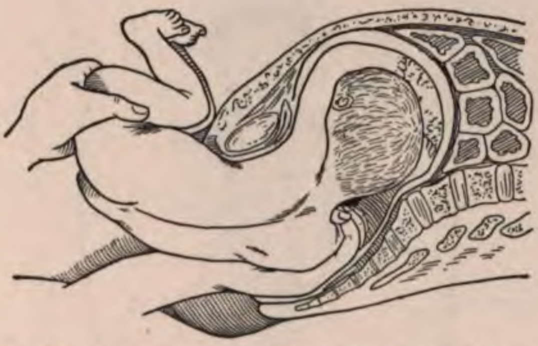


Fig. 74.—Disengagement of the posterior (right) arm.

Even in the hands of the best operators and with the best assistants the arms sometimes become unavoidably extended. Although their extraction must be accomplished in as rapid a manner as possible, there is no need of breaking the arm if care is taken.

The arm which is to the rear is usually more easily liberated. To do this the operator seizes the legs with one hand and carries the child's body well upward. This will cause the posterior shoulder to be more readily reached, and will permit more room for the manipulations necessary. Two fingers of the disengaged hand the back and posterior shoulder (Fig. 74). The w be pulled down gently so that the arm may be . As soon as the humerus is felt it is to be pushed ward and toward the opposite shoulder. Now, by drawing the umerus do ard the arm becomes flexed at the elbow and the earm rests the chest of the child. Its extraction after this is mple, and same as in unextended cases. If it is impossible

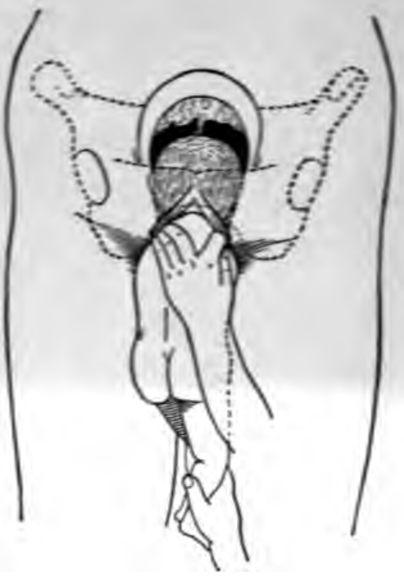


Fig. 75.—Showing direction of traction.

to extract the arm in this way, the operator should pass the palmar surface of his hand over the abdomen of the child and attempt to hook one finger over the elbow of the posterior arm, and by gentle traction flex it over the chest. (Plate XXXVII, B.)

After the posterior arm has been liberated, the child's body should be carried downward, and the anterior arm is rarely difficult of extraction. Should, however, there be any trouble in releasing it, the anterior shoulder is to be rotated to the rear, where, with more room, its extraction is simple.

With the arms released the operator hastens to extract the head.

If firm pressure has been maintained on the fundus the head should be found in the pelvis, either straight or somewhat flexed.

Extraction of the head may be accomplished either manually or instrumentally. Inasmuch as less danger to both child and mother results from manual extraction, forceps on the after-coming head should be left as a last resort.

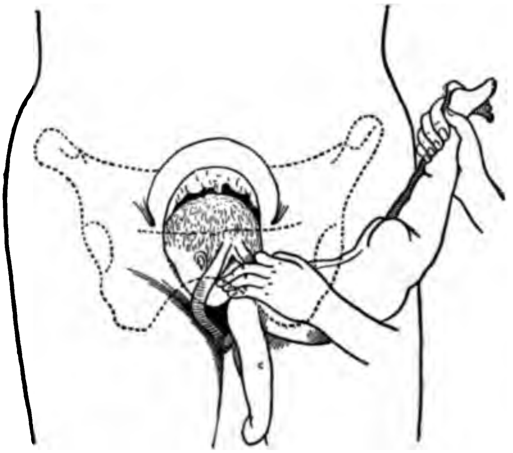


Fig. 76.—The child is lifted over the perineum and the occiput passes from under the symphysis.

If there be no great disproportion between the head and the pelvic outlet, extraction will not be difficult.

The child's body should be wrapped in a warm towel. Grasping the pelvis, with his left hand placed underneath the child and allowing the legs to straddle over his arm, the operator seizes the child's neck with his right hand, the palmar surface of the hand being over the shoulders of the child and the neck between the middle and third fingers (Fig. 75). Firm traction is now made almost directly downward. When the occiput has engaged immediately behind the pubic arch, the child's body is to be carried directly upward (Fig. 76). In favorable cases, the face, brow, and head will sweep over the perineum and extraction will be complete. So easy an extraction as this is the exception, however, from the very fact that those cases which demand version usually presuppose a disproportion between the size of the head and of the pelvic canal. When such is the case, other manipulations are necessary. The operator, as in the preceding method, lets the child's body rest on his left arm. The middle and index fingers of the left hand are passed into the vagina until the fingers can be applied on either side of the child's nose, the tips of the fingers resting over the malar prominences. Traction is made with this hand downward, while with the right hand the occiput is pushed upward and forward. This manipulation has the tendency to flex the head. As soon as flexion is accomplished, the operator grasps the child's neck with his right hand in the manner described above, and now with both hands makes firm and continued traction. The left hand should remain over the malar prominences, and not be introduced into the child's mouth, if firm traction is to be made with that hand. Traction with the finger in the mouth does not produce flexion to the same degree, and if much force is used fracture of the jaw will probably be produced. If, however, the delivery is very difficult and prolonged, if any convulsive movements of the child indicate an attempt at respiration, or if the pulsations of

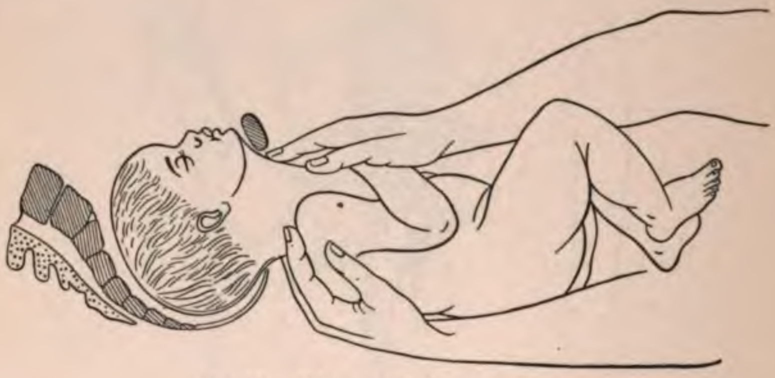
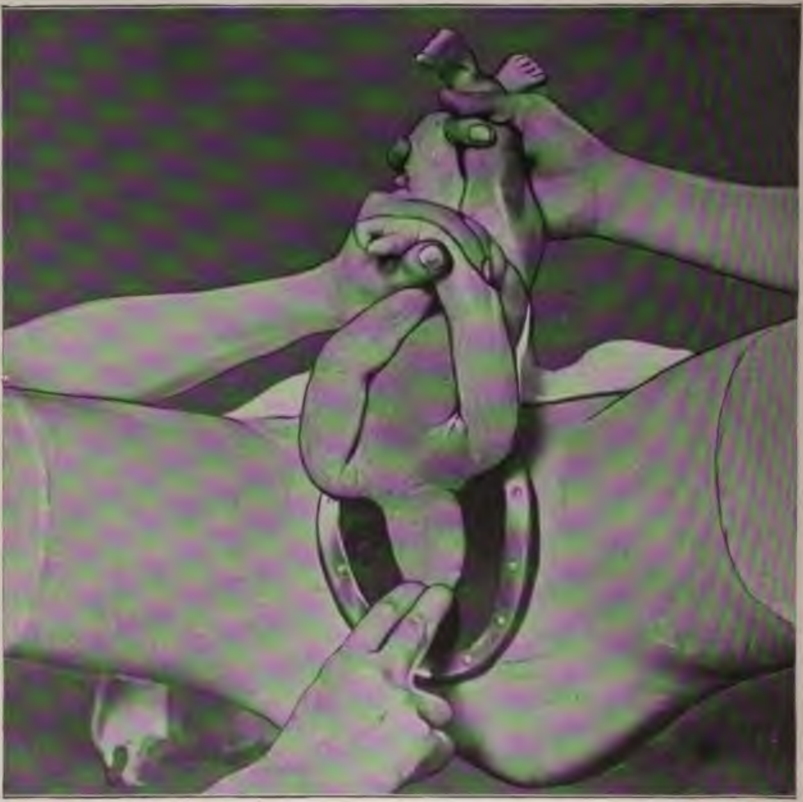


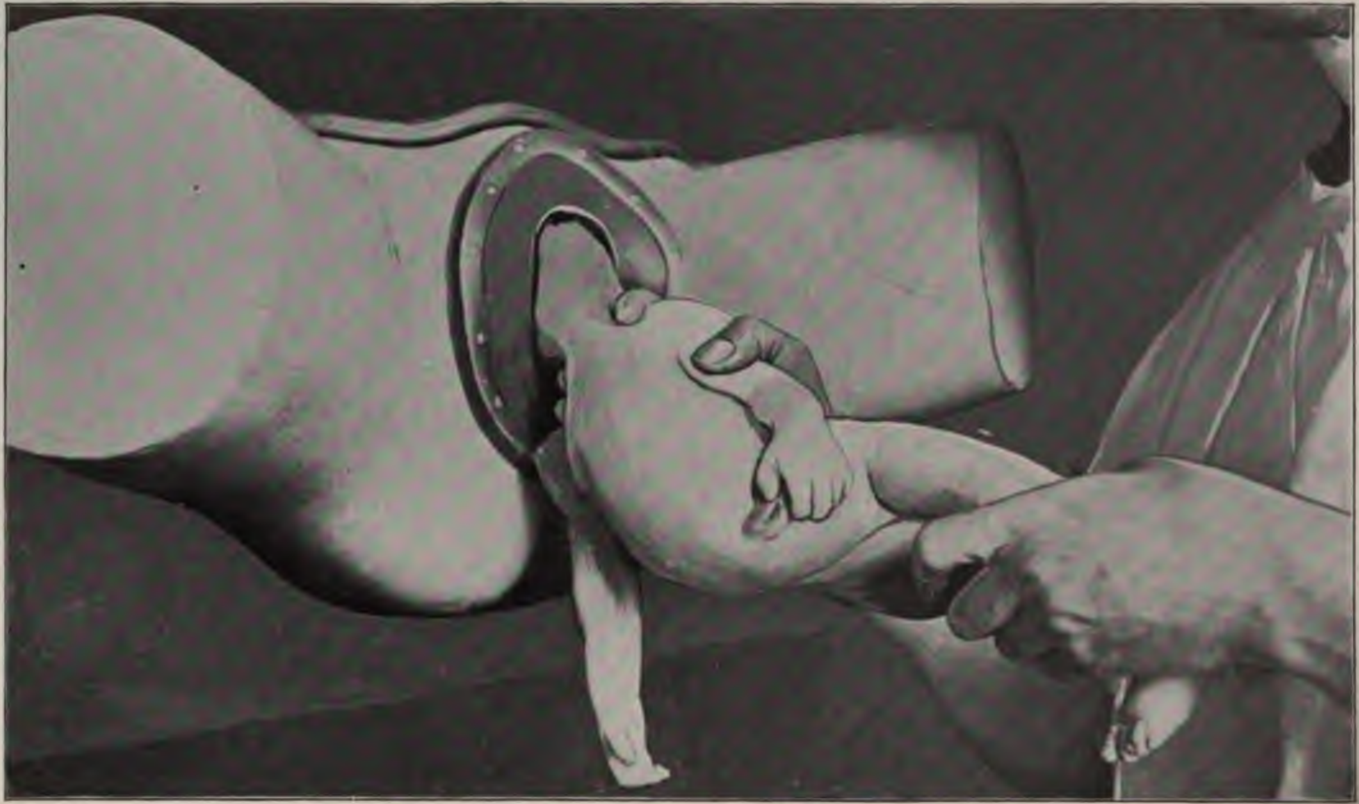
Fig. 77.—Chin arrested at symphysis.

*PLATE XXXIX.*



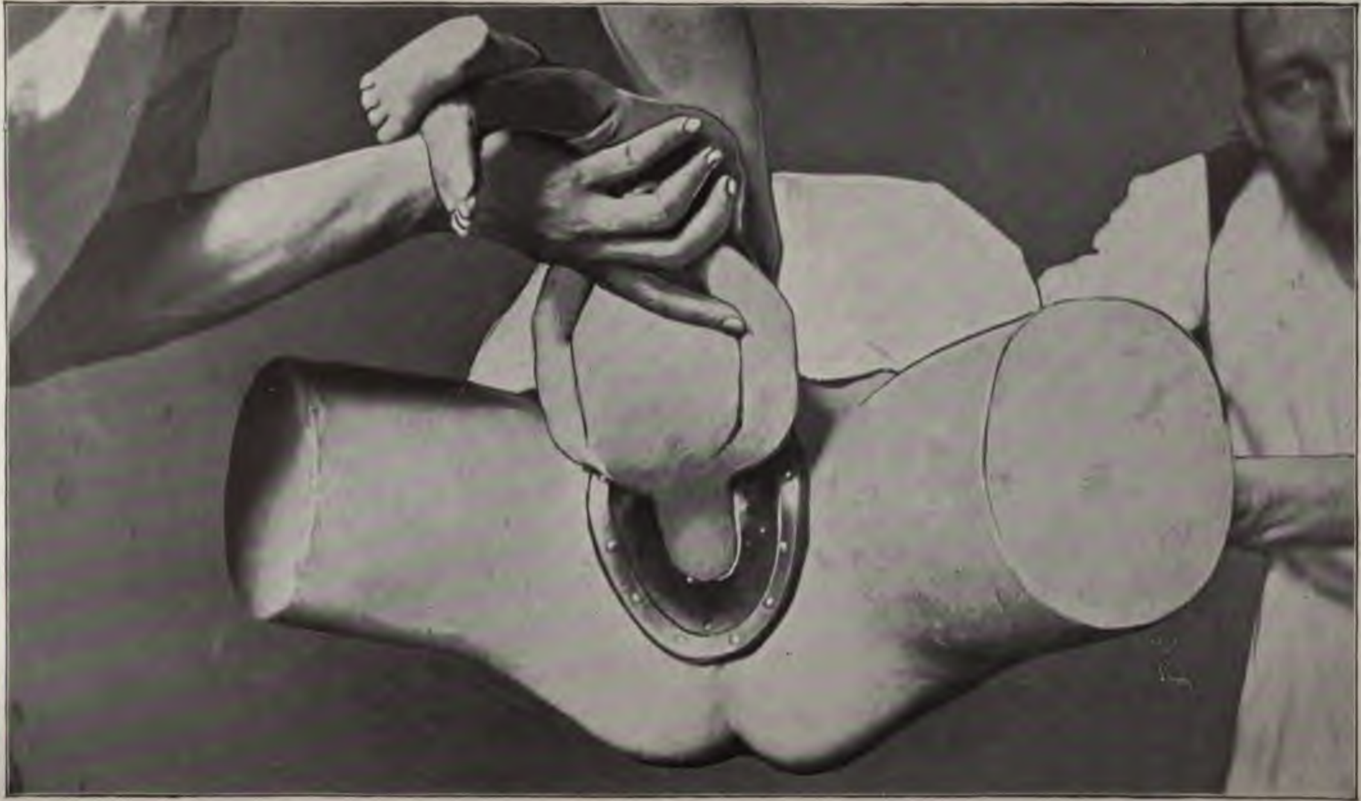
*Head Impacted at the Outlet. Admitting Air that the Child may Breathe.*

*PLATE XLI.*



*Traction while the Head is in the Transverse Diameter of the Pelvis.*

PLATE XL.



*The Child is Lifted Over the Perineum and the Occiput Passes from Under the Symphysis. An Assistant makes Suprapubic Pressure.*

the cord are becoming imperceptible, a most valuable procedure is to introduce two fingers into the child's mouth, and by slightly separating them permit air to enter the child's mouth, so that respiration may be established. The right hand must now be depended upon to make the necessary traction to complete the delivery. (Plate XXXIX.)

If the head become arrested at the brim, extraction is far more difficult. Here the feet must be grasped with the left hand and the right fingers placed so as to straddle the nape of the neck, and traction is to be made directly downward. At the same time the assistant makes firm pressure from above, forcing the head downward. (Plate XL.) Should the head fail to descend, it will often do so if it is made to enter the brim in a transverse position. To do this, the operator, in place of making traction while the back of the child is directed upward, turns the entire body of the child so that the back is directed to the side which corresponds with the shoulder that was posterior. (If the left shoulder was posterior, the back of the child should be turned toward the left side of the

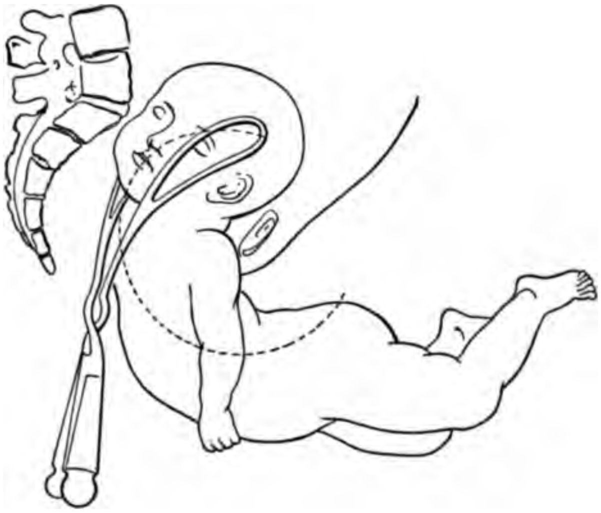


Fig. 78.—Forceps applied to after-coming head.

pelvis.) Now, by making traction directly downward, the head will enter the brim through its greatest diameter and descend into the lesser pelvis. Traction now will usually result in the occiput turning forward, when extraction may be completed as described before.

Should the occiput not rotate forward, and this always indicates faulty technique, since proper traction on the trunk ought invariably to bring the occiput to the front, then the perineum, instead of the symphysis, becomes the fulcrum, and downward traction will cause the face and brow to sweep under the symphysis and delivery is completed. (Plate XLI.)

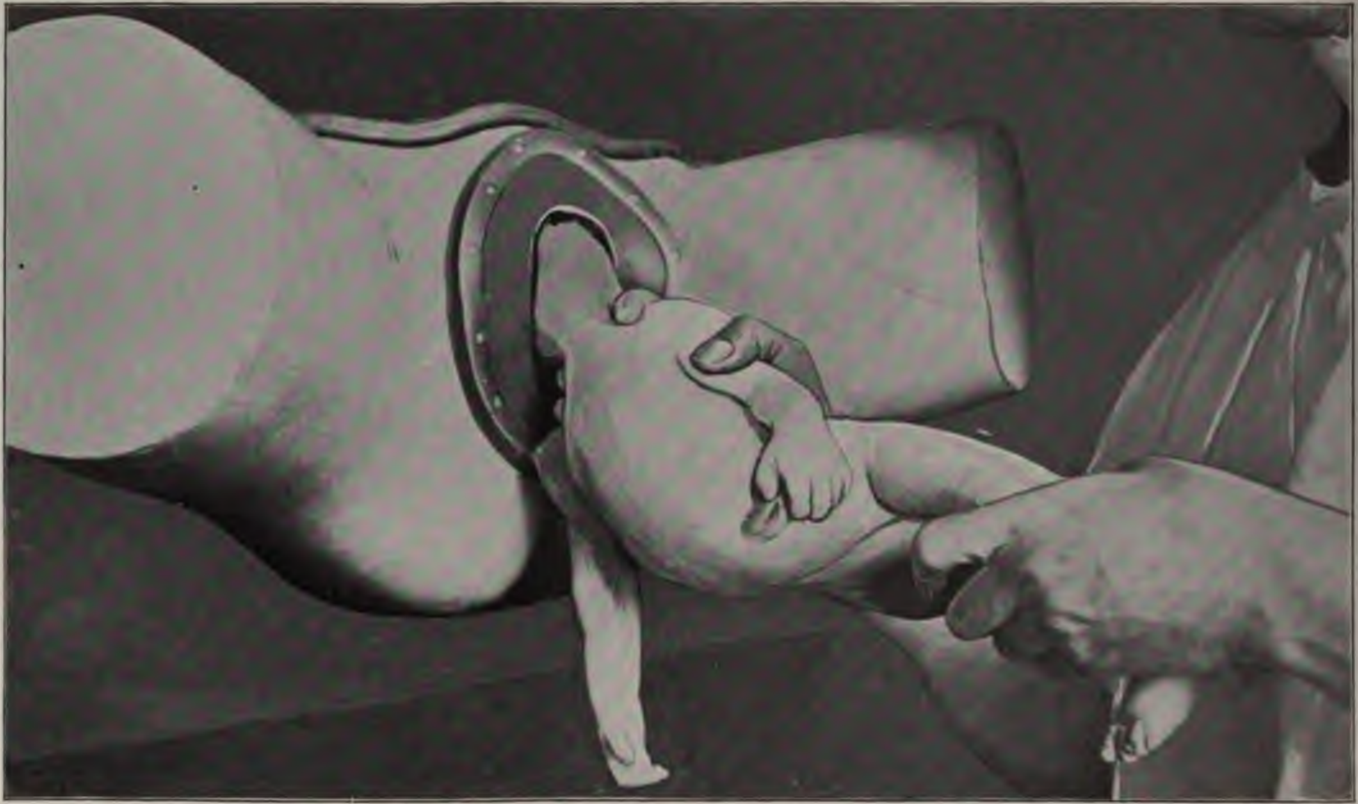
In case, however, extension has taken place and the chin becomes arrested behind the symphysis (Fig. 77), traction should be made upward and two fingers of one hand should be passed into the rectum, the hand protected by a rubber glove, and the occiput "shelled" out over the perineum.

When one or another of these means has been tried and failed, forceps should be applied. The authors have obtained better results with the short-handle Hunter forceps than with any other used. Usually the forceps can be adjusted posteriorly (Fig. 78 and Plate XLII, A) better and more quickly than anteriorly, but it should be applied to that aspect of the child which can be most rapidly reached. It should be applied to the sides of the pelvis regardless of the position of the child's head.

It must be remembered that after extraction of the arms the head must be delivered within three to five minutes if a living child is to be obtained. It is true that in exceptional cases a living child may be extracted within fifteen minutes, but this is very rare. Care must be exercised that the forceps does not slip during extraction, or else grave injury will result to both mother and child.

As has been stated before, internal rotation of the fœtus is an operation which must be included in the consideration of versions, for the operation consists in turning the child in its long axis. This operation is indicated only in occipito-posterior positions, while

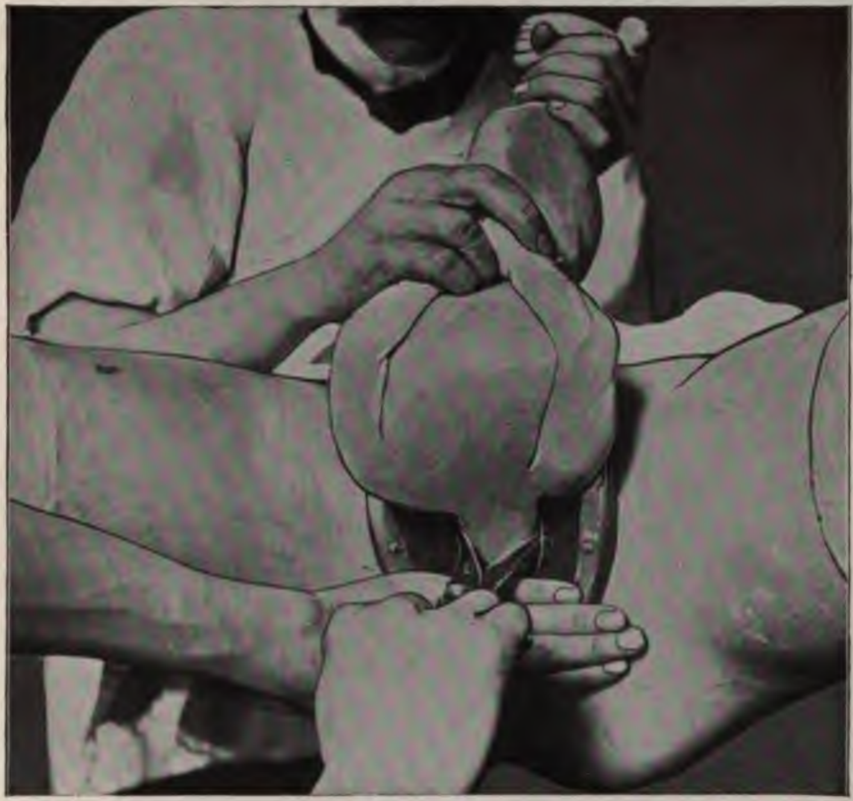
PLATE XLI.



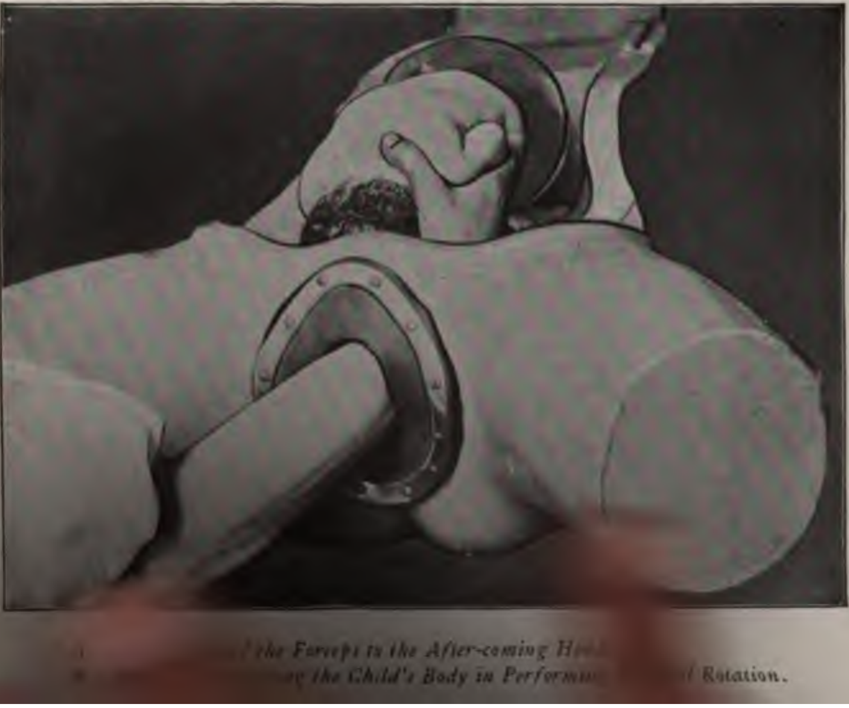
*Traction while the Head is in the Transverse Diameter of the Pelvis.*

## PLATE XLII.

A



B



[illegible] the Forceps to the After-coming [illegible]
[illegible] the Child's Body in Performin[illegible] Rotation.

the head is yet movable above the brim. The operation should not be performed if the head has firmly engaged, nor if the waters have drained away, nor if for any reason the labor must be hastily terminated. If the waters have already drained away and the uterus is firmly contracted around the child, it will be necessary to apply forceps and hope for rotation in the descent. In the great majority of cases this rotation will ensue. If there is any reason to hastily terminate the labor, it is better to perform podalic version and extract, provided always the necessary conditions are present. An occipito-posterior position is, as a rule, associated with slow engagement, and this is often the first factor which attracts the attention of the obstetrician to the fact that the labor is not a normal one. The physician often makes his first examination in a somewhat perfunctory way,—that is, he satisfies himself that the head is presenting, and perhaps determines that the cervix is slowly dilating. If such has been his course, and if after several hours repeated examination shows but little increase in the dilatation of the cervix, or that the head does not engage even under the influence of firm uterine contractions, he should at once determine what conditions are present which are prolonging the first stage.

An examination with one or two fingers introduced into the vagina, even conjoined with abdominal palpation, will often not result in the information necessary to determine this point. Certainly it will not if the patient is nervous and resists the physician's efforts. An anæsthetic should be administered if satisfactory results are to be obtained from the examination.

The preparation of the patient and the operator should be the same as for podalic version. The operator introduces that hand into the vagina which he is in the habit of using when making a vaginal examination. If the cervix is dilated so that two fingers can be passed into the uterus, no further dilatation will be necessary at this time. The head should be carefully raised between pains, and no undue pressure made upon the membranes. The fontanelles are sought and examined. If any doubt of the real in after this, the ear should be felt; this will be an le.

occiput is posterior the cervix should be dilated, preperforming the internal rotation, in the same way as een cribed for podalic version. With the cervix fully and is introduced into the uterus. If the head has eng ged, it should be gently pushed up. The fœtus is gras and slowly rotated in its long axis until the occiput terior. (Plate XLII, B.) The hand should now be slowly drawn until the head can be grasped, and in this position the erator waits for uterine contraction. When this has occurred head is driven down and engagement ensues. It is wise to remain the hand until two or three contractions have taken place, so that the head may be firmly engaged. The case may now be left to nature, or, if necessity demands, the forceps may be applied and extraction completed.

The course of action herein advocated is not novel, nor is it as radical as at first sight it may appear. The management of occipito-posterior positions has for a long time been a matter of strife among obstetricians. The lever, the forceps applied inversely, podalic version, the conversion into a face presentation,—such means from time to time have been advocated. When the occiput, in faulty position, has become impacted, certain of these measures are forced upon us, with consequent damage to the woman and with as yet not sufficiently recognized injury to the fœtal brain.

For the purpose of rotation nothing can take the place of the *aseptic* hand, aside from the fact that at one and the same time the hand may detect any additional anomaly hitherto unsuspected, such as pelvic deformity, which, aside from being a further cause of slow or impossible engagement, may alter the field of election at the very best time (from the stand-point of both the woman and the fœtus),—that is to say, when the conditions are still favorable for version or some other procedure.

When the occiput rotates backward into the hollow of the sacrum, we are face to face with what—there is uniform agreement—constitutes one of the most difficult cases in obstetrics. The clean, educated obstetric hand at the pelvic brim is a source of positive safety to both the mother and child, compared with waiting until exhaustion calls for, for instance, the forceps within the pelvic brim.

A tedious first stage, characterized by short, nagging pains, is a fairly-uniform accompaniment of the instances which should cause anxiety. It seems clear that *manual* examination at this time will often lead to the adoption of a procedure which will alter the prognosis of, and lessen the difficulties attendant upon, the persistent oblique and sacro-rotated occipital position.

This procedure, which has been persistently advocated by the authors, has been much criticized on the ground, first, that internal rotation of this nature is not permanent and, secondly, that, dilatation having been accomplished and the hand being in the uterus, the wiser plan is to perform podalic version. The first objection falls to the ground in face of the established fact that over and again the manœuvre has succeeded. Those who fail simply twist the head. They do not rotate the body. The second objection carries more weight, and where the dystocia is due to the pelvis and not to the fœtus its truth is now granted. But, if the size of the fœtus added to the malposition is the cause of the tedious labor, it will be found advantageous in all instances except those of emergency to give nature a chance to dilate the pelvic canal, as also to mold the fœtal head. It is a sound obstetric rule not to interfere needlessly either by forceps or version. Marx objects to this teaching on the ground that the woman having been anæsthetized it is wiser to proceed at once and perform version. Whilst Grandin and Jarman admit the cogency of his argument, the success secured by them teaches them that the procedure has scope of great utility and that, when successful, it leaves more to Nature and requires less from Art—as a completed version of necessity does.

## PROGNOSIS.

Naturally the prognosis will vary greatly according to the conditions demanding the operation. In those cases where retraction of the uterus has not taken place, and where there exists no disproportion between the head and pelvis, the prognosis for the mother should be absolutely good if the operation is performed under aseptic precautions and in a skillful manner. The same may be said of the child if the operation is undertaken before the fœtal heart shows signs of failure. In the proportion, however, as these favorable conditions decrease will the mortality-rate of the child increase. There should be no mortality at any time for the mother unless uterine retraction has taken place, the operation being done only as a last resort, or where the pelvic outlet is markedly disproportionate to the fœtal head. This may be determined by the hand precedent to attempts at version, and then an alternate operation, such as pubiotomy, may be elected.

# CHAPTER XVI.

## SYMPHYSIOTOMY AND PUBIOTOMY.

### (*a*) SYMPHYSIOTOMY.

THE operation of symphysiotomy was first performed in the year 1777 by Jean Rène Sigault. After a protracted convalescence the ultimate result was successful, and this led other operators to test the procedure. The results, however, were not sufficiently favorable to lead to its general adoption, as shown by the fact that up to the year 1858 the operation was performed only 86 times, with the loss of 29 women and the extraction alive of 29 children. The operation thence fell into disuse until the year 1866, when it was revived in Naples by Morrisani and Novi. Outside of Italy, however, it attracted scarcely any attention, receiving but scant, if any, reference in works on obstetrics until the year 1890, when, largely through the publications of Pinard, of Paris, and Harris, of Philadelphia, the attention of obstetricians was attracted to the really beneficent results which were being secured through timely resort to it. The unfavorable results from the operation during its early years were unquestionably due to the lack of appreciation of the necessity of both asepsis and of election, and therefore our study of the operation need be based purely on the results which are yielded in modern times, when both of these factors play the chief rôle in obstetric surgery.

In 1892 Harris collated the operations which had been performed from January, 1886, up to July, 1892, as follows: 44 operations, with 1 maternal death and the loss of 4 children. Up to this time the operation had never been performed in the United States, although pr tetricians had been giving much attention to another tion having in view the avoidance of embryotomy,—the Cæsarean section. From this date on, however, as if by magic, operations were reported from various sections of the country. Pinard, of Paris, became a very enthusiastic advocate. The inevitable result of the rapid acceptance of the operation was a high death-rate, in a measure due to the inexpertness of many of the operators. Further still, more accurate pelvimetry and greater expertness with forceps and version, combined with the use of the Walcher position, would have proved symphysiotomy unnecessary. Some men cannot resist the temptation of endeavoring to make a record in a new field. The result has been that to-day the operation, in this country, is very infrequently performed, particularly since expert obstetricians have been giving more and more attention to an alternate operation—the Cæsarean section. Further still, as will be noticed shortly, a newer operation, pubiotomy has entered upon the scene.

*Indications and Limitations.*—The aim of the operation of symphysiotomy is, through section of the pubic joint, to allow of separation of the symphysis, whereby the pelvic diameters are widened sufficiently to enable the delivery, *per vias naturales*, of a fœtus which otherwise would have to be sacrificed. The operation, then, is performed purely in the interests of the child, taking the place of embryotomy and displacing the Cæsarean section from the stand-point of the relative indications. Before the resuscitation of symphysiotomy, indeed, the alternative was either mutilation of the fœtus or the subjection of the woman to the major operation of abdominal section. It was hoped that symphysiotomy, by being made an elective operation, with possible lowering of the maternal mortality-rate to *nil* would replace embryotomy in cases of minor contraction, leaving the Cæsarean section for instances of major contraction. In the United States, however, the time is not ripe for such an extreme statement, much as such a result is desirable. In maternity hospitals, with thorough equipment, the view is tenable, perhaps, but not in private practice. Here the woman or her representative must continue to exercise the right of choice until the mortality-rate from symphysiotomy, or its alternate, pubiotomy, has fallen as low as, in the hands of an expert, is associated with embryotomy.

Through experiment on the cadaver we have learned that when the pubic symphysis is cut and the knees of the cadaver are separated the pubic bones diverge, without inflicting damage on the sacro-iliac joints, to the extent of two and three-fourths to three inches. Into the opening formed in front the presenting part of the fœtus may enter and the following space is gained in the various diameters of the pelvis. The true conjugate increases to the extent of from one-fourth to one-half inch and the transverse and oblique diameters gain from three-fourths to one and a half inches. It is at once apparent how, with a fœtus of average size, this operation enables delivery to be accomplished without mutilation of the fœtus, since the gain in the pelvic dimensions applies with equal force to the types of deformed pelves most frequently met with,—the flat and the generally contracted. About the same gain in the true conjugate is yielded by placing the woman in the Walcher position; that is to say, with the thighs hanging over the edge of the bed or table. This point should be borne in mind in any case where the contraction is slight, since, if the conditions be otherwise favorable, forceps or version may succeed—especially in the flat pelvis.

The indications for the operation are as follow: The consent of the woman or her representative. The fœtus viable and the woman and the fœtus not exhausted through protracted labor. Careful precedent pelvimetry, instrumental and manual, proving that there exists dystocia which will not yield to either version or the forceps and testifying to the existence of a type of pelvis where, after pubic section, the sacro-iliac synchondroses will yield. In the generally-contracted pelvis the conjugata vera must be at least three and three-fourths inches in dimensions, and in the flat pelvis, where it will be borne in mind the transverse diameter is relatively wide, the conjugata vera may be reduced even to two and three-fourths inches if the child is below the average size. In impacted occipito-posterior positions and in irreducible face presentations. The cervix must be dilated or dilatable. The presence of ankylosis of one or the other sacro-iliac joint must be ruled out.

Before passing to a consideration of the technique of the operation, it is well to recall briefly the structures involved in the operation and to point out the risks to which the maternal structures are subjected. In the vast majority of women at or near term there exists normally a certain amount of separation at the symphysis, provided this be not ankylosed, when, of course, the operation is *per se* contra-indicated. The operation is entirely extraperitoneal, the bladder being stripped of the peritoneum, and the urethra lying immediately under the symphysis. In certain instances, however, as Dickinson, of Brooklyn, reminds us, the peritoneum pouches downward, and there may be danger of injuring this.

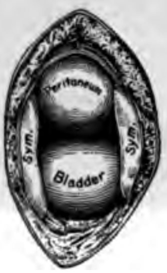


Fig. 79.—The bulging of peritoneum and of bladder into the opening at the joint. (Dickinson.)

As a rule, however, the bladder and the urethra are the only organs which are likely to be injured, and these, we will show, need not be if the requisite care is taken during the performance of the operation and afterward when the parts are brought together. We are speaking now, of course, of the suprapubic performance of the operation, the method which is favored by most practical accoucheurs. The open method of operating involves the structures and the vessels which cover the anterior face of the pubes, and the selection of this method of operating converts symphysiotomy into a much more serious operation and complicates greatly convalescence as well. The method described by Ayers is entirely different from either, as will be noted.

The two factors which control the result of this operation are *election* and *asepticism*. Where the operation is indicated it should be performed in a timely manner, and to-day there is no excuse for inattention to the stringent rules of cleanliness whereby the surgery of the present is so sharply differentiated from that of the past. If but one lesson has been taught by the results secured, it is that symphysiotomy need not have a mortality-rate. As will be noted later, the fatal cases resulting since the rejuvenation of the operation have been due either to the fact that the operation has been performed on an exhausted woman, or else, because, through inattention to asepsis, the woman has succumbed to septicæmia.

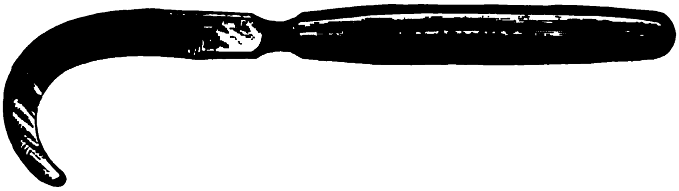


Fig. 80.—Galbiati-Harris knife. (Harris's modification.)

The instruments essential for the performance of the suprapubic operation are: a stout, blunt-pointed bistoury, a few artery-forceps, a needle-holder, needles, a metallic catheter, or a metal sound. Silk-worm gut forms the preferable material for sutures. The Galbiati knife, which is highly favored by the Italians, has been found unnecessary. Indeed, in certain cases, the use of this instrument is dangerous to the integrity of the maternal parts, if resort to it be at all possible.

In certain exceptional instances the symphysis of the pubes deviates from the midline, and in others the union of the halves is not cartilaginous, but bony. When this untoward complication is present it will be impossible to separate the symphysis with a knife, and a chain-saw is requisite. Fortunately, this occurrence is a rarity; still, the physician should be prepared for every emergency, and, therefore, should add a saw to his armamentarium.

*Technique of the Suprapubic Operation.*—The method of operating which is favored by the vast majority of those who have had practical experience is the suprapubic one. There are weighty reasons why the open methods (along the anterior face of the pubes) should be rejected. If this is selected it will be very difficult to avoid infecting the wound with lochia during convalescence, and, further, the tissues near the clitoris are peculiarly vascular,—all the more so during pregnancy,—and section made in this neighborhood exposes the woman to the risk of considerable hæmorrhage of a type very difficult to control. There are a sufficient number of modern instances of the operation on record now, where the suprapubic method was followed, to prove its perfect feasibility, and in certain cases its wonderful simplicity. Although trained assistants are helpful, their presence is not strictly requisite.

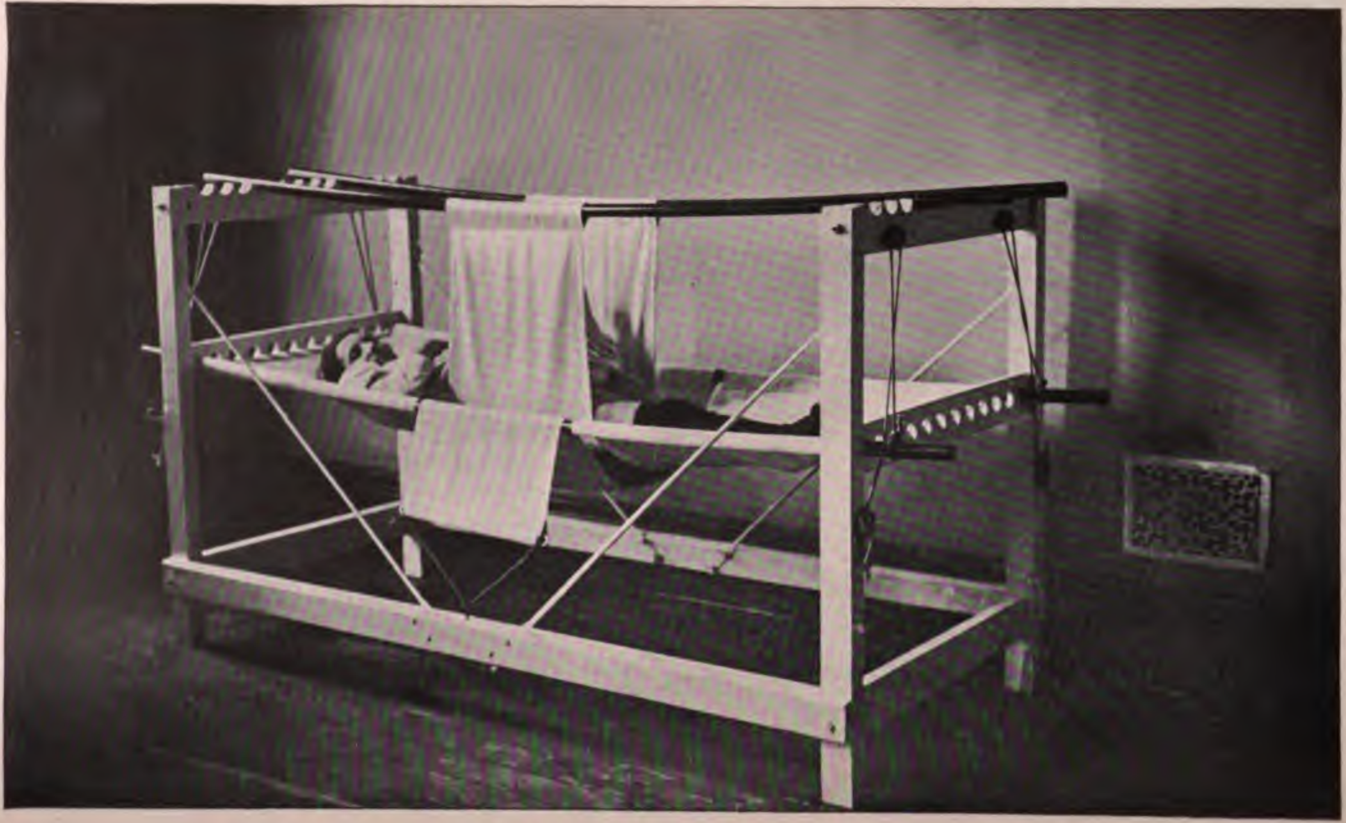
The woman having been anæsthetized, the abdomen is prepared as for an abdominal section,—that is to say, the pubes are carefully shaved and thoroughly disinfected. The bladder is emptied. An incision is made in the midline down to the recti muscles, beginning at the suprapubic eminence, and extending upward for about three inches. The recti are separated by the finger and the handle of the scalpel, and this brings us to the retropubic space. A catheter is now inserted into the bladder and handed to an assistant to depress the urethra from under the pubes. This is a highly-important step, since one of the accidents associated with the performance of symphysiotomy is injury to the neck of the bladder. The accident is entirely avoidable, and much depends, therefore, on the assistant who holds this catheter. The operator's index finger is next inserted under the symphysis to further protect the bladder, and it must be held there until the section of the pubic symphysis is completed. If the fœtal presenting part has not as yet engaged, or, in case it has, if the part can be pressed upward, the inserting of the finger is easy, and there remains further space for the Galbiati knife if the operator prefer it; but in case of engagement of the fœtal part it will be found difficult to insert the finger, and, this accomplished, there is scant room, if any, for the sickle-shaped knife. Hence the reason why later operators have discarded this knife and substituted the stout, blunt-pointed bistoury. The finger being in place below the symphysis, the union of the pubic bones is incised in the direction from below upward and from within outward. The operator must not be satisfied until he has severed the inferior ligament of the pubes. If he fail to accomplish this the pubic bones simply separate at the top, and there is scant gain, if any, in the pelvic diameters. As soon as the subpubic ligament has been severed, the pubic bones separate and the pelvis becomes enlarged. As already noted, a separation of from two and one-half to three inches is possible without inflicting damage on the sacro-iliac synchondroses. In order to avoid separation beyond this, an assistant on either side of the woman should make firm inward pressure on the trochanters whilst delivery is being effected.

Any hæmorrhage occurring during the steps of the operation should, if arterial, be checked by torsion or ligature. Venous oozing, which is apt to be considerable, is met by the tampon with sterilized gauze. This tampon is left in place until delivery has been effected.

It has been claimed that after division of the symphysis delivery should be left to nature, except in instances where the condition of the woman or the fœtus requires hasty action. There is, however, no advantage in this. The cervix being dilated or dilatable, since the woman is under anæsthesia, there is nothing to be gained by delay. If the head is above the brim, the membranes unruptured, or if the presenting part has just engaged and the membranes are intact, the conditions favorable for version are present and there is no valid reason why the physician should not proceed to deliver after this fashion. The chances are that the operation of symphysiotomy has been called for on account of maternal or of fœtal dystocia, and under such condition, where version is possible, it should always be elected over the forceps. Where the presenting part has engaged, but cannot be delivered short of symphysiotomy, owing to contraction of the outlet, the forceps should be applied *lege artis*. If the operation of symphysiotomy has been elected to enable the delivery alive of a fœtus presenting in a mento-posterior or in an occipito-posterior impacted position, then, after symphysiotomy, the malposition should be corrected as far as feasible, and delivery be effected by the forceps.

After completion of the third stage of labor, the operator should turn his attention at once to the repair of the wound made necessary by the symphysiotomy. The aseptic catheter is again introduced into the bladder and handed to an assistant in order that the urethra and the bladder may be pressed downward carefully whilst the pubic bones are being brought into apposition. This step is a most important one. If neglected, or if carelessly performed, the bladder or urethra will be nipped in the symphysis, and in the course of a few days a fistula will be established. The thighs of the woman are rotated inward, and firm pressure is made on the trochanters by two assistants. The pubic bones are thus brought together, and are held there until the wound in the abdomen has been properly sutured and the bandage has been applied. It is useless to attempt to suture the symphysis. Nor is this necessary. Where the operation has been performed aseptically, and a proper bandage is applied, the pubic bones will remain in apposition and unite firmly. Unless the woman is specially fat, deep silkworm-gut sutures will suffice for bringing together the abdominal wall. If the woman is stout it is preferable to unite the fascia of the recti muscle by a running catgut suture and to treat the skin and fat by the open method, which insures, in such cases, firmer union. After the sutures are in position and the usual dressing has been applied, a wide strip of adhesive plaster, extending from the trochanters nearly to the umbilicus, is carried around the woman, whilst the assistants are maintaining firm pressure on the trochanters. This immobilizes the pelvis efficiently, and, barring indication of suppuration in the wound, this dressing need not be changed for from five to ten days. The Ayers apparatus, if obtainable, is

PLATE XLIII.



*Ayers's Apparatus for Use After Symphysiotomy* very useful. (Plate XLIII.) The after-treatment of the case is exactly similar to that which holds for the normal puerperium, except that very likely it will be necessary to catheterize the woman. The woman should be kept on her back for the first week, but after this period she may lie on her side. She should be kept in bed for at least three weeks, although cases have been allowed to rise sooner with apparently no bad effect. As a rule, in every woman, after symphysiotomy there will exist, for a variable interval, a greater or less degree of motion at the joint, but we question if this is

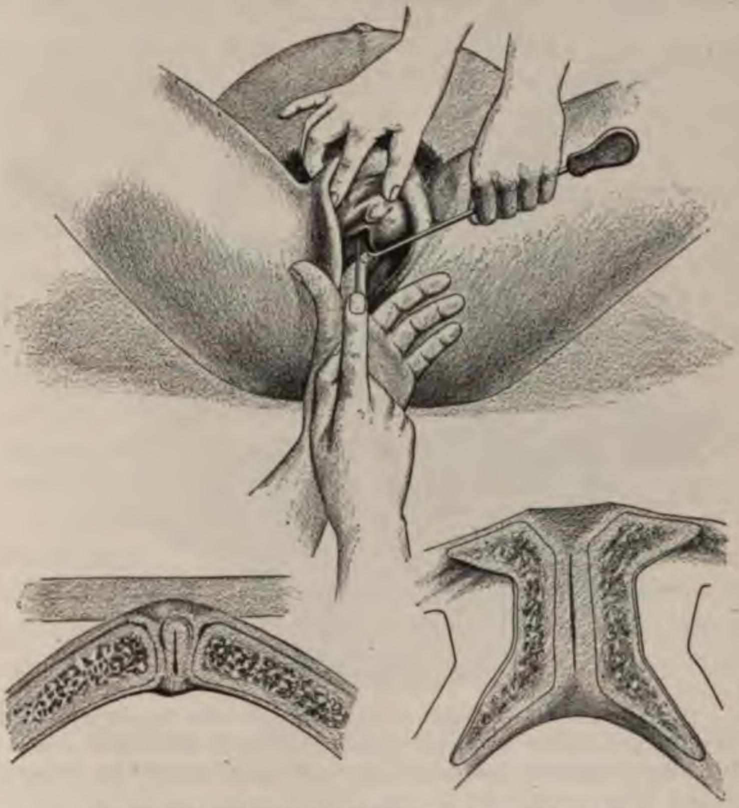


Fig. 81.—Ayer's method of performing symphysiotomy.

greater than that which normally exists in young primiparæ after a difficult non-instrumental labor. The fact seems to have been overlooked that in probably the majority of gravid women there exists motion at the symphysis for a variable interval. This motion, however, is not associated with disability, and before very long the fibrous tissue becomes organized and motion cannot be detected.

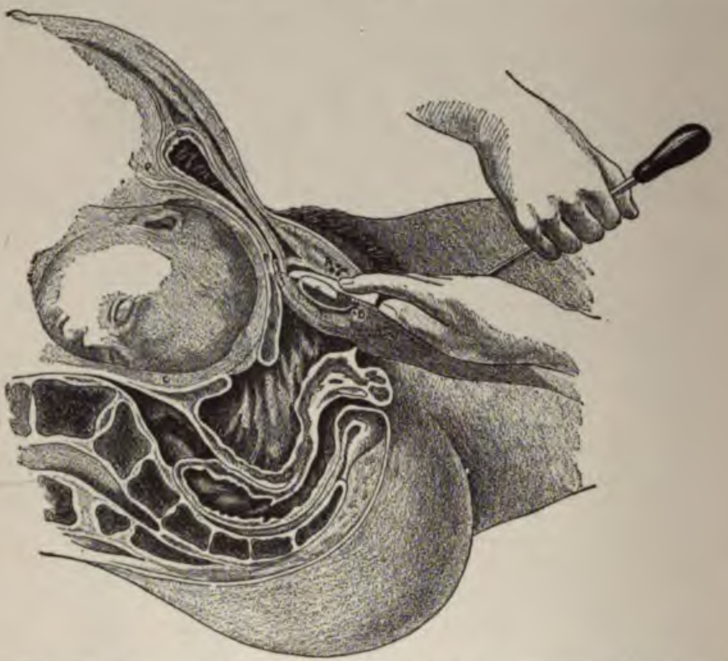


Fig. 82.—Showing relation of adjacent structures to symphysis. *A*, vessels of the clitoris; *S*, symphysis pubis; *B*, bulbi vestibuli; *C*, amnion; *D*, bladder—higher than usual; *P*, peritoneum; *H*, anterior lip of cervix.

Even if there should remain a degree of separation at the symphysis after symphysiotomy, we should not look upon this as an evil, for in the event of a future pregnancy a second operation might not be demanded should the woman be allowed to go to term.

*Method of Operating Subcutaneously.*—E. A. Ayers, of New York, prefers the subcutaneous operation, and has performed it a number of times. His directions are as follow:—

1. Secure full dilatation of the cervix, if possible without risk to the child.
2. Have the urethra and bladder held to one side with a sound.
3. Make the initial incision a little above the subpubic arch and under the *elevated* clitoris.
4. Introduce the left index finger within the vagina, against the posterior groove or ridge of the joint, up to the top.
5. Pass a narrow tenotomy-knife, with the point close to the joint, up to within a half-inch of the top, and *under* the overlying soft tissues.
6. Substitute a probe-pointed bistoury; meet the left index finger with the probe over the top of the joint, and work the blade through the joint downward until separation is felt by the posterior finger.
7. Have an assistant press the mouth of the wound and the tissues lying over the joint with a small piece of gauze.
8. Deliver with forceps, if possible, and refrain from suprapubic pressure, aiming to deliver the head through the cervix without drawing the latter down below the symphysis.
9. Hold the bladder well to one side while pressing the pubic bones together.
10. Pass a small strip of gauze into the prepubic wound, and another against the cervix, after irrigating, leaving both pieces exposed for easy removal, having refrained from stitching cervix or perineum.
11. Introduce a soft-rubber retention-catheter into the bladder and leave it until sure the patient can voluntarily micturate.
12. Dress the vulva with gauze and strap the joint with adhesive strips.
13. Remove all the gauze in thirty-six hours and irrigate vulva and vagina twice a day, keeping the vulva carefully dressed between-times.

*Complications.*—In the reported modern cases, the only ones which need concern us, the most unfortunate complication noted has been the formation of a fistula of the urinary tract, either vaginal or abdominal. The essential step for avoiding this we have already laid stress upon. If, notwithstanding, the accident should occur, often the lesion will heal spontaneously under cleanliness and catheterization. If spontaneous repair should not occur, then, some time after the puerperium, a secondary operation will be called for. It is a noteworthy fact that fistulæ have chiefly occurred in instances where the operation has been resorted to only after the fœtal presenting part had become wedged in the pelvic brim, and where the Galbiati knife had been used. We believe that when it becomes the practice to elect the operation before engagement, or, at any rate, before futile attempts at engagement have necessarily resulted in more or less pressure on the neck of the bladder, this complication will become excessively infrequent. Further, we question if the use of the Galbiati knife, in cases where the presenting part has engaged, is not responsible for many of the fistulæ. As we have already stated, when the presenting part has engaged there is scant room for the insertion of both the finger and the knife under the symphysis in the suprapubic operation. The insertion of the finger is absolutely necessary in order to insure the safety of the bladder; the Galbiati knife is not necessary for the performance of the operation. The majority of operations in this country have been performed without this knife, and we would, therefore, limit its utility to instances where the fœtal presenting part has not engaged, and where, therefore, there is ample room both for the finger and the knife.

Hæmorrhage as a complication of the operation need not be feared where the subcutaneous method is selected. At best this is only venous oozing, which is easily controlled by the gauze tampon. The open method of operating (along the anterior face of the symphysis), which we do not indorse, entails, of course, wounding of the venous plexuses of the vestibule, as also the vessels which nourish the clitoris. Hæmorrhage from this source may be very difficult to control, and the essential manipulations required carry extra chance of infecting the woman. The open method of operating, then, should be strictly reserved for instances where the deviation of the symphysis from the midline, or where the bony ankylosis forbids the performance of the operation by means of the knife, and calls for the chain-saw.

The further complication which is responsible for the loss of a fair percentage is septic infection,—a complication common to every surgical procedure, and an avoidable one.

When the operation was resuscitated it was feared that the ultimate result as regards locomotion would be bad. The record of the modern cases certifies, however, that this fear is unfounded. In many of the women there exists for a variable period a certain amount of motion at the joint, and in some cases the women complain of a sensation of motion there; but before long the fibrous tissue becomes organized, and these physical and rational symptoms disappear.

Ayers investigated this subject, and reported on 72 operations performed by 44 operators. Osseous union occurred in 5 cases; fibrous union in 10; close union in 16; firm union in 26; perfect union in 5. In 4 there existed separation to the extent of ⅞ inch; in 1 less than ½ inch; in 1, ¼ inch, and without exception the pubic joint was in a condition of satisfactory union. Grandin saw 1 of his cases—nearly four years after operation—and there existed absolute immobility.

## PROGNOSIS.

For the purpose of estimating the prognosis we can only take into account the operations which have been performed since rigid asepsis has ruled. In general, the mortality-rate is about 8 per cent. Individuals have operated repeatedly, however, without death. To be fair, it should be stated that many of the fatalities have been due to causes unassociated in any way with the operation. Often the operation has not been an elective one, that is to say futile attempts have been made with forceps or version, when careful study of the pelvis should have taught the attendant that both were contra-indicated. Any operation performed upon an exhausted woman or in the presence of infection, the follower of careless instrumentation, must carry a mortality-rate.

It may be definitely stated, that, where symphysiotomy is an operation of election, it should not have a mortality-rate. Yet, in the boundary line cases even the most expert is going to try an alternate method—such as the forceps, before deliberately opening the symphysis. Thus, then, we feel that the operation must remain one adapted specifically to maternity hospitals. In private practice, other things equal, the woman or her representative will elect embryotomy, except where deliberate judgment of one or more experts prevails and counsels the elective Cæsarean section.

### (b) PUBIOTOMY.

*Pubiotomy,—Hebotomy or Hebosteotomy,* is an operation intended to replace symphysiotomy, standing between embryotomy and the elective Cæsarean section, that is to say, the section under the relative indications. Its introducers claim that it is a simpler and a safer operation than symphysiotomy, and the results, so far, testify to the justice of the claim as regards simplicity and, in a measure, as regards safety.

The indications for the operation are identical with those which hold for symphysiotomy. As regards the pelvis the consensus of observers places the limit at a true conjugate of 3½ to 3 inches, in the presence of an average-sized fœtus. Where the fœtus is over size and the pelvis is normal, a relative indication exists. As regards the fœtus a further indication is found in the impaction of a normally- or an abnormally-placed head. A *sine qua non* is a living fœtus, otherwise, of course, embryotomy becomes the operation of election. Experience has also taught, that, even in the presence of a mild grade of infection, pubiotomy is safer than symphysiotomy.

The sphere of pubiotomy would appear to be exceedingly limited, even as holds for symphysiotomy. Any individual operator who reports a large number of instances, should be viewed as a man who is careless in the study of the indications. It should never be forgotten that, under ordinary conditions, a woman may be delivered by version though a pelvis with true conjugate of 3¼ inches, provided that the extreme Walcher position be utilized as the head is being made to pass through the contracted inlet. Thus we increase the diameters by from ¼ to ½ an inch. Of course, here as elsewhere, the problem of moment is the size of the fœtal head, and if this head be relatively small, the field of pubiotomy becomes still further limited, since at 3 inches of true conjugate we place the absolute indication for the Cæsarean section.

In technique, the operation is far simpler than symphysiotomy, especially where the open method is selected. After the subcutaneous methods, the dangers of lesions and of hæmorrhages are greater.

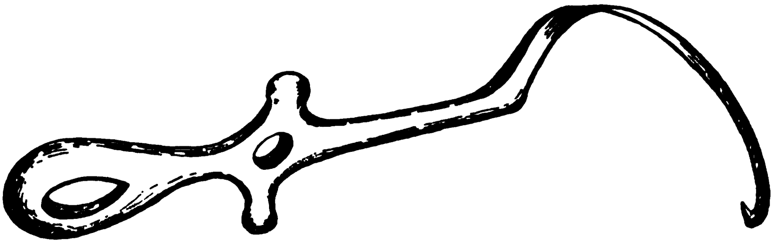


Fig. 83.—Blunt needle of Doederlein.

The instruments required are a bistoury, a few artery forceps and either the sharp needle of Bumm or the blunt needle of Doederlein (Fig. 83.) Where the open method is followed, and this we prefer, a periosteal elevator is requisite. In addition, the Gigli saw is necessary.

*Operation by the Open Method.*—The pubes are shaved and the abdomen is scrubbed with soap and water, next with 60 per cent. alcohol, and then with 1 to 5000 bichloride solution. The woman is placed in the lithotomy position. The bladder is emptied by catheter. The spine of the pubis is located and an incision is made down to it (Figs. 84, 85, 86.) The periosteum is raised from the bone with the elevator. The Doederlein needle is passed through the channel which has been made, and under the guidance of the finger in the vagina it is carried downward until the point is felt at the labium majus. This labium is pushed towards the vulvar cleft carrying the plexus of veins with it, the skin is incised and the point of the needle is delivered. The Gigli saw is attached and the needle is withdrawn carrying the saw around the pubic bone. The saw, being held so as to be at right angles with the bone, is worked back and forth and the bone is severed. There is a sudden giving away of the parts, and this is controlled by firm pressure at the hip joints, thus preventing overstretching, which might result in injury to the ilio-sacral joints or tear of the soft parts. The woman is placed in the exaggerated lithotomy position, and delivery is finished by forceps or by version according to indication. We prefer this method to the expectant which leaves the case to Nature.

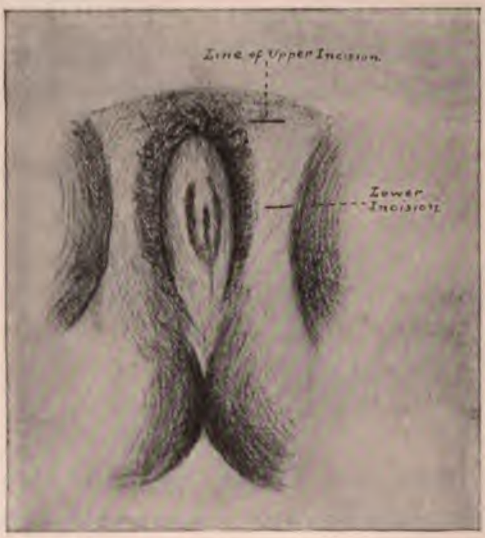


Fig. 84.—Left labium displaced in order to avoid injuring large plexuses. (From nature before preparation, showing two incision sites.)

When the child has been delivered, lesions of the soft parts are at

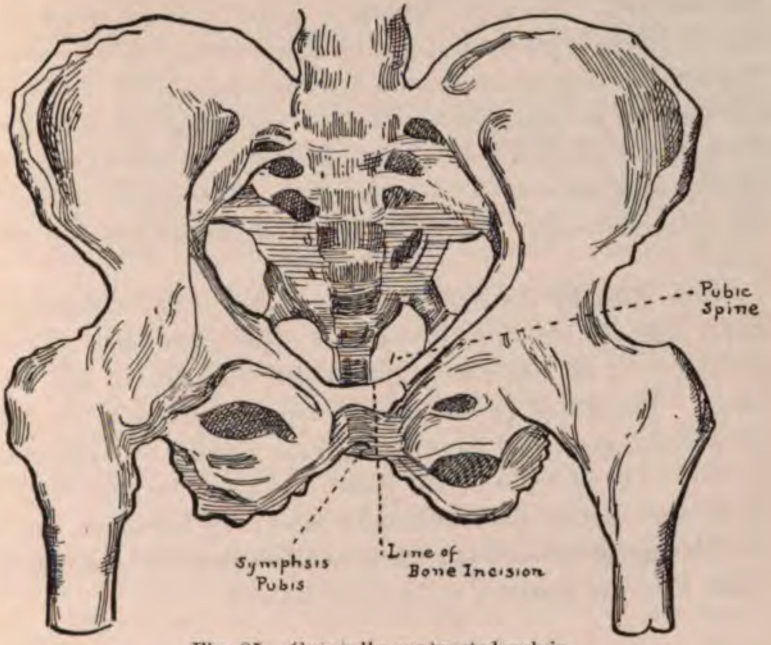


Fig. 85.—Generally contracted pelvis.

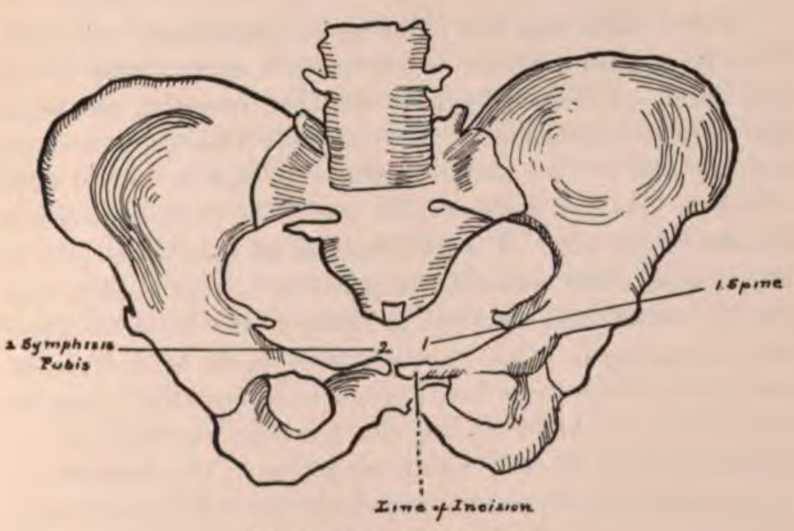


Fig. 86.—Flat rachitic pelvis.

# CHAPTER XVII.

## ABDOMINAL AND VAGINAL CÆSAREAN SECTION.

## THE DÜHRSSEN OPERATION.

When the fœtus is delivered by means of an incision made through the abdominal and uterine wall, the operation is known as the abdominal Cæsarean section. When the fœtus is delivered by means of an incision made through the cervix into the lower uterine segment *per vaginam*, the operation is known as the vaginal Cæsarean section.

### Abdominal Cæsarean Section.

The application of the rules of modern aseptic surgery has placed this operation on the plane where it may be considered from an elective standpoint. The statistical data offered by the past fifteen years render the operation a life-saving one both for mother and child, and well-nigh relegate the mutilating operations, the child being alive, to the ash-heap. Further, the ancient prejudice amongst physicians and the laity is slowly but surely disappearing. No longer is the Cæsarean postponed until the woman's vital forces have been spent in futile attempts by forceps and version to accomplish the impossible, but the indications being laid with almost mathematical exactitude, a predetermined section is performed, with results to woman and to child which are noted further on.

*Indications.*—These are either absolute or relative. Where the contraction of the pelvis is so marked that delivery of the fœtus *per vias naturales* is impossible, or where the pelvic canal is blocked by tumors, benign or malignant, the indication is absolute.

The relative indication has wider scope, and the views we state would not have been admissible a few years ago—say fifteen, when the high mortality-rate contra-indicated even the thought, at times, of the operation under the absolute indications. Further, the expertness gained through our familiarity with abdominal section for other conditions, has made us bold to tread where the men of not a generation ago feared to venture. The high mortality consecutive to difficult embryotomy, the great risk of infection in consequence, the repulsion every physician feels against the taking of fœtal life, these factors have aided the establishment of the abdominal Cæsarean section on the basis of a *predetermined*, *elective* operation.

We face the relative indications as follows: Given an instance of pelvic deformity in which the chances of delivery of a live child *per vias naturales* are slim, and examination under anæsthesia with the hand in the pelvis is our most certain way of judging both pelvic capacity and size of fœtal head, and the time for the induction of premature labor with resulting live child having passed, we are justified in advocating the Cæsarean section, abdominally, provided the fœtal heart-sounds are clear and strong. The operation becomes one of election, and not a *dernier resort* operation. The woman is carefully prepared, even as she would be were the abdomen to be opened for other condition, the time is set either just before the onset of labor, and this we favor, or when labor pains have set in, the woman has no chance to become exhausted either by nature or through art, the abdomen is opened and the child is delivered *lege artis*. When the operation becomes considered from such standpoint, embryotomy of the living fœtus becomes a lost art.

*The Operation.*—The woman is prepared even as she would be for other abdominal type of operation: The pubes are shaved, the skin cleansed by soap poultice, followed by scrubbing with soap and water, 60 per cent. alcohol, and 1 to 2000 bichloride. The nurse and the assistants, as well as the operator, prepare their hands after the customary fashion. Thus the major risk the woman is subjected to—septic infection, is eliminated.

After the woman has been anæsthetized, the bladder is emptied by catheter and the operation proceeded with. The instruments

The upper incision is closed by suture and a small l at the lower angle, to be removed on the second day. legs are straightened, adducted and rotated inwards, severed ends of the bone are brought in apposition. immobilized by a broad strip of adhesive plaster ex- the crests to the hip joints. The woman is kept in weeks. The most absolute asepticism must be main-

*rati* [illegible] *he* [illegible] *Method.*—The difference is [illegible] nee [illegible] s [illegible] ed either from below or from [illegible], around the pubic bone, is [illegible] aded with the saw and with- wn. The risk of perforating the venous plexus with resulting ematoma is great, and there is far greater liability of injuring the ladder. Therefore, as before stated, we prefer the open method. By the later method the complication most to be feared is a hernia, and this may be reduced to a minimum if during the operation the muscle fibres are separated and not cut through.

## PROGNOSIS.

This is better than that following symphysiotomy, and yet, so far as the elective operation is concerned, it stands simply on the same plane. The statistics from the open operation are better than from the subcutaneous. The mortality-rate, on an average, may be placed at 5 per cent., and this is too high to warrant us in calling the operation a conservative one. The fœtal death-rate is also about 5 per cent. The complications are many, consisting in hæmatomata, which suppurate, in phlebitis, in vaginal tears, and, after the subcutaneous method, in injury to the bladder. These complications occur, it is to be remembered, in the hands of expert men, for as yet few tyros have attempted the operation. Further still, fracture of the sacro-iliac joint has been recorded. As regards bony union the after results are perfect. The diameters remain permanently larger, as proven by the fact that the succeeding labor has been normal. Therefore, the proposition has been seriously advanced that a deliberate osteoplastic operation should be performed in the non-gravid state in order to permanently enlarge a deformed pelvis.

A review of European and of American statistical data teaches us that the sphere of both symphysiotomy and of pubiotomy is exceedingly limited, and it is an open question if the latter will survive much longer than its predecessor, the former. This statement holds absolutely for maternity hospitals, where we take the ground that an elective Cæsarean section should always take the precedence. Such section, in the hands of competent men, does not show a mortality-rate as high as pubiotomy, and the fœtal survival is about as high. Further, the complications of the puerperal state do not exist after the section to a degree approximating in the slightest those which we have shown follow upon pubiotomy. Indeed, the conditions being similar, and election being possible in hospitals, the classic Cæsarean section should always be preferred. In private practice, conditions are, of necessity, different; election can rarely rule. The major part of obstetrics falls to the lot of the general practitioner, and he is prone to test every method of delivery before attempting either symphysiotomy, pubiotomy or the Cæsarean section. In the minds of the laity, furthermore, an abdominal incision implies great, even though imaginary, risk. Here, the proposition to make a pubic section will appeal forcibly. And thus, as regards private practice the matter must rest until skilled physicians become also skilled obstetricians and then the weight of evidence will so strongly favor the elective Cæsarean section as to impress the mind of even the layman. Both symphysiotomy and pubiotomy will then become relics of the past under the lime light of the data yielded by the predetermined, elective Cæsarean section.

tented that silk is preferable on the ground that catgut is likely to become untied. This has not been our experience. Two sets of sutures are requisite—the deep and the superficial (Lembert sutures).

The deep sutures are inserted about one eighth of an inch from the edge of the uterine incision, and pass through the muscular tissue, avoiding, however, the mucous membrane, and out at the other side. The needle used should be round and half-curved with no cutting edge. These deep sutures are placed about one-quarter inch apart. They may be interrupted or one long strand may be passed and then the loops are cut, as is shown in the figures. These sutures are now tied after the surgical fashion. At times, during this stage, the Trendelenberg position is of assistance.

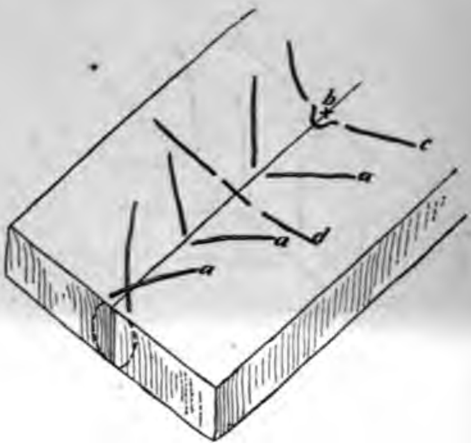
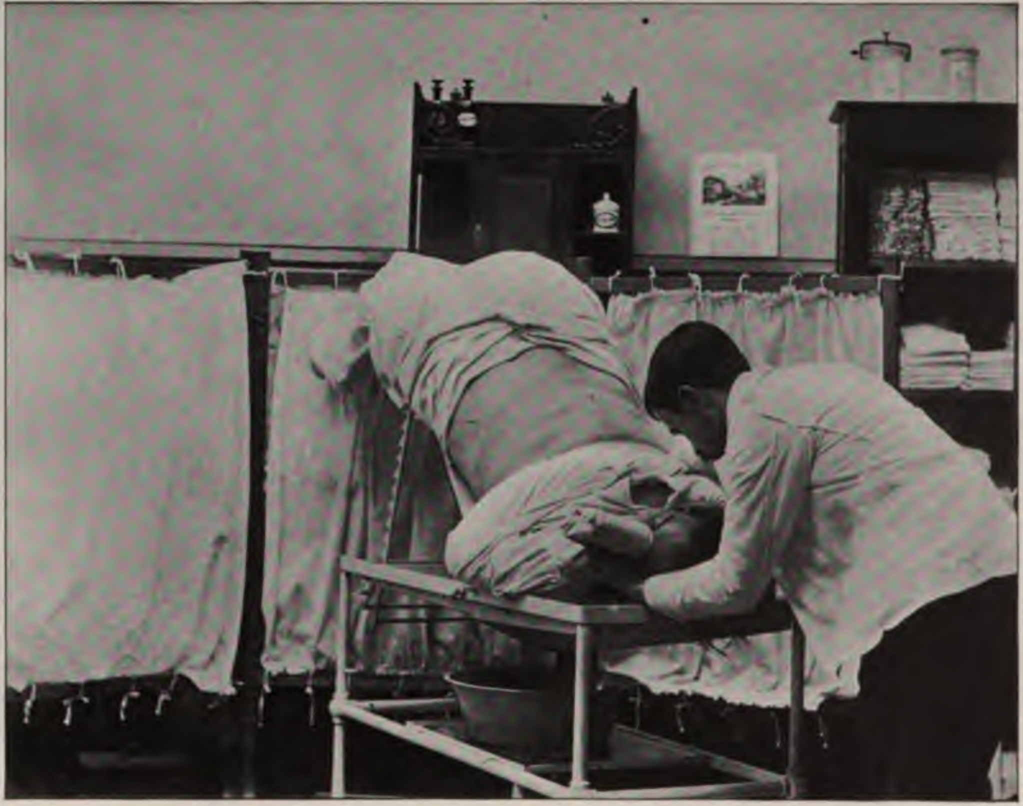


Fig. 89.—Suture of uterine wound. *a*, deep muscular suture; *b*, deep muscular suture tied, with the ends cut short; *c*, sero-serous suture passed over deep suture; *d*, sero-serous suture between the deep sutures, ready to be tied.

The superficial, or Lembert sutures, are now passed. The object of these sutures is to cover the deep sutures and to approximate serous surface to serous surface. The introduction is shown in the figure.

The peritoneal cavity is now dried and the abdominal incision

PLATE XLIV.



Trendelenberg Position.

is closed in tiers, that is to say plain number one catgut for the peritoneum, number two catgut, chromicized, for the fascia, and plain subcuticular stitch for the skin. The usual dressings are applied, strips of adhesive plaster are wound around the abdomen, and the woman is placed in bed. The time which the average operator will require for the performance of the operation as described by us, should not exceed forty-five minutes. At any time during the operation stimulation by strychnia, hypodermatically, or infusion of salt solution and whiskey by the rectum may be called for.

The after treatment is simple. In order to maintain uterine contraction ergot should be given by the mouth or hypodermatically. The strip of gauze protruding into the vagina is removed at the end of forty-eight to sixty hours. The woman is allowed all the water to drink she wishes, since thus the kidneys are stimulated, the intestines made to functionate, and since thus, also, that very distressing factor, dry retching, is avoided, the woman washing out her stomach. After nausea has ceased, give broths and after thirty-six hours place her on solid diet should she crave it. There is no hurry about moving the bowels. When the woman complains of discomfort order a simple or a glycerin enema, and a drachm or two of compound licorice powder. Codein, in two-grain suppositories, may be ordered for pain, repeating every five to six hours. This drug neither paralyzes peristalsis, nor interferes with the digestive tract, as other derivatives of opium do. In case of tympanites, order one-fiftieth grain of hyoscin hydrobromate under the skin, repeating every hour until the pupils are widely dilated, for thus we relax spasm, the cause of tympanites in the absence of infection. The abdominal dressing is changed about the tenth day, unless there be indication of suppuration. The woman should be out of bed in about sixteen days.

Such is the method of conducting the *elective* operation. The woman if not infected should recover.

Where the operation is performed as a last resort, when the nan exhausted, possibly has been infected, the outlook be- ies g my. Hence our plea for deliberate election.

Statistical data, culled from foreign and domestic sources, ces the mortality-rate at about 5 per cent. Individual operators 'e had large series without death. Here, as elsewhere in com- ıg statistics, the individual equation enters as the important tor. Difficult embryotomy, carries a higher mortality rate, es- ially since such operation is left to the last moment and is rarely, vadays, performed by an expert.

## LAPARO-HYSTERECTOMY, OR THE PORRO OPERATION.

This operation consists of the abdominal Cæsarean section, *plus* a hysterectomy. It was devised at the time when the classic section-mortality was so high that it was deemed necessary to remove the uterus after the child had been extracted. Nowadays, it is reserved for instances where, after extraction of the fœtus, there exists multiple fibroids, or an infected uterus, or such a degree of uncontrollable uterine inertia as forbids the closing of the abdominal cavity with safety.

*The Operation.*—The same preliminary preparations of the woman and of the hands of the attendants, etc., are required. The additional instruments requisite are a ligature-carrier, such as the Cleveland, and six curved hysterectomy clamps, of the model shown in Fig. 90.

The high abdominal incision must be made in order to avoid injury to the bladder. After extraction of the fœtus the steps of an ordinary hysterectomy are followed. The technique to be preferred is the following: The broad ligaments are clamped on each side down to the reflection of the bladder, that is to say two clamps are applied on each side, the one close to the uterus and the other at the infundibular end, including the tubes and the ovaries if they be diseased, otherwise not. The tissue between the clamps is severed down to the bladder reflexion. The bladder is stripped down and to the sides in order to carry the ureters well out of the way, and, if the cervix be not diseased or we are not facing an infected uterus, this organ is severed at the level of the internal os; where the reverse holds, that is to say the uterus is infected or the cervix is diseased, the ligature-carrier is passed close to the uterus under each uterine artery and these vessels are secured by number 4 catgut, plain. Then the cervix is removed with the uterus. After supravaginal hysterectomy the cervix is closed with number 1 chromicized catgut and the broad ligaments are quilted downwards from one infundibular end to the other. The cavity is mopped dry and the abdomen is closed without drainage. Where the indication necessitates total hysterectomy the upper edges of the vagina are quilted, the raw surfaces are covered with two-inch plain packing gauze and its end is carried into the vagina. This gauze is removed at the end of about sixty hours.

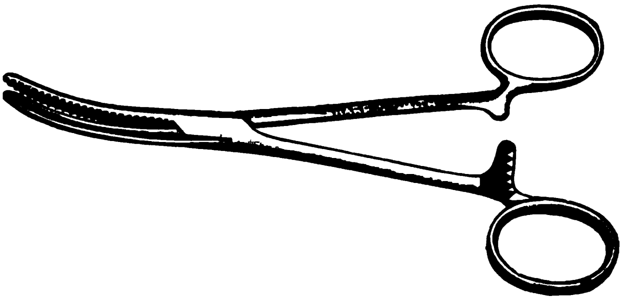


Fig. 90.—Ochsner's hysterectomy clamp.

The after treatment is absolutely the same as was noted for the classic section. The operation is associated with greater shock and measures to meet this are often requisite.

Under the modern technique, which calls for rapid operating, the mortality-rate from laparo-hysterectomy is simply that of the operation for a fibroid uterus, *plus* the fact that the Cæsarean is superadded. Of course if the hysterectomy is called for because of infection the mortality varies according to the grade and the extent of the infection. In the hands of the expert we place the mortality-rate of the simple instances at about 5 per cent. In the infected cases so much depends on the resisting power of the woman and the kind of the infection that no definite data may be given.

A general review of the operation per abdomen, teaches us that where the operation is predetermined, *elected*, other things equal, it should not carry a mortality-rate. On the average it may be placed at 5 per cent. The result of asepsis and of election has been to place the modern abdominal Cæsarean section on the same plane as other major abdominal operations, with the addition of saving at least 90 per cent of infants otherwise infallibly doomed.

## I. VAGINAL CÆSAREAN SECTION.
## II. THE DÜHRSSEN OPERATION.

These operations are to be considered together because the one is opposed to the other and the conditions demanding them can best be thus exemplified.

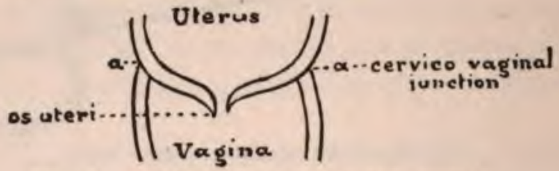


Fig. 91.—Supra-vaginal portion disappeared.

I. THE VAGINAL CÆSAREAN SECTION.—This operation consists in delivering the fœtus through the vagina after precedent cutting into the lower segment of the uterus. It is indicated only in emergencies such as threaten the life of the woman or of the fœtus, and where time for the performance of the abdominal Cœsarean section is lacking. Such emergencies may be offered by the toxæmias, by concealed hæmorrhage, by placenta prævia where dilators and the manual dilatation are too slow. A *sine qua non* is the presence of a pelvis normal for the size of the presenting part. A contracted pelvis is a strict contra-indication. Here, if time be lacking for the performance of the classic abdominal section, embryotomy is the alternative, for neither is there time for symphysiotomy nor for pubiotomy. Further still, it is contra-indicated where the cervix has merged into the lower uterine segment for then the Dührssen operation finds its sphere of utility.

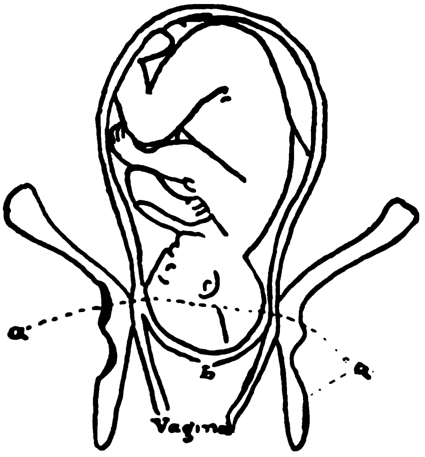


Fig. 92.—Fœtal head in situ, vaginal portion disappeared. *a*, Cervico-vaginal junction. *b*, Os uteri.

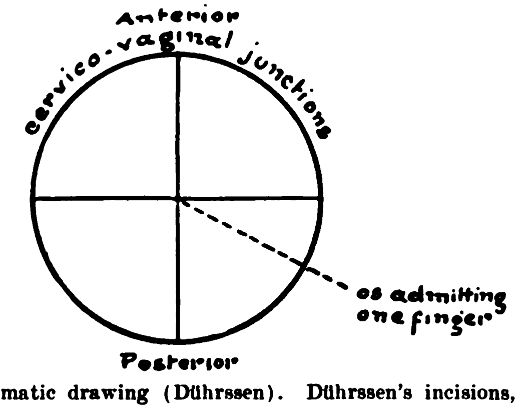


Fig. 93.—Schematic drawing (Dührssen). Dührssen's incisions, looking from below.

*Technique.*—The vagina is prepared aseptically. A broad perineal retractor is inserted, the cervix is seized by a bullet-forceps, a cross section is made into the vagina anteriorly, the bladder is pushed upwards, a longitudinal section through the anterior wall of the vagina extending nearly to the urethra is made, the bladder is carried well upward. The anterior pouch of the peritoneum is not opened. The uterus is slit anteriorly above the internal os. Thus we secure the necessary dilatation. The child is delivered by forceps or version. The cavity of the uterus is packed with plain sterile gauze, to cause contraction and to guard against the hæmorrhage of relaxation. Prior to this, of course, the placenta is removed manually. The cut into the uterus is closed with chrome catgut, number two, the stitches not including the mucosa; the cut in the anterior vaginal wall is similarly closed, and the woman is put to bed. The gauze is removed after thirty-six hours, meantime, ergot, or ergot and cottonroot suppositories are administered to contract the uterus.

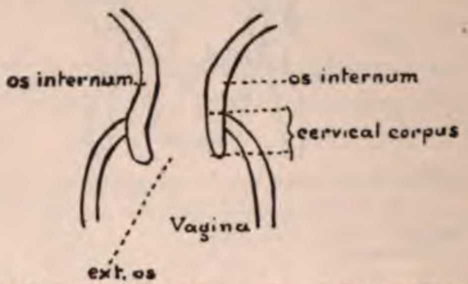


Fig. 94.—Vaginal portion still present. Contra-indication for the incisions: suitable for vaginal section. (Dührssen.)

II. The Dührssen Operation.—The indications for this operation are similar to those stated as belonging to the vaginal Cæsarean section. A *sine qua non* is that the vaginal portion of the cervix shall have merged into the lower uterine segment. This condition obtains frequently in the primipara, at or near term.

*Technique.*—This is well shown in the figures. Figs. 91 and 92 show the conditions present necessary for its performance. Fig. 93 represents a cross-section viewed from below. For the incisions a bistoury or scissors answer. They are to be carried, in order to be at all effective, completely up to the vaginal junction. In Fig.

91 the incision from the os uteri to the vaginal junction is shown at a. Fig. 94 represents the four incisions, anteriorly, posteriorly and laterally on each side. These incisions rarely require suture, and if the operation is aseptic they heal kindly.

These operations, we insist, are purely emergency ones. Whenever time permits, precedent gauze dilatation and next manual dilatation of the cervix are called for. And to repeat, in the presence of a pelvis too small for the child or a child too large for the given pelvis, our preference is for the classic abdominal Cæsarean section.

The prognosis does not hinge upon the operative procedure but depends absolutely on the nature of the indication which calls for either operation.

# CHAPTER XVIII.

## EMBRYOTOMY.

UNDER the term "embryotomy" are included a number of operative procedures which have received distinctive names, but the uniform aim of which is to deliver the fœtus *per vias naturales* after its mutilation to a greater or a less degree. In modern times the sphere of these operations has been greatly narrowed, owing to the perfection in technique and in results of induced labor and of Cæsarean section on the one hand, and, in a measure, owing to the resuscitation of symphysiotomy and the appearance on the scene of pubiotomy.

Embryotomy, generically considered, includes the following operative procedures: 1. Craniotomy. 2. Cephalotripsy. 3. Evisceration. 4. Decapitation. 5. Cleidotomy. 6. Basiotripsy or Cranioclasty to the Breech.

In general the indications for these operations are: 1. Contracted pelvis, the fœtus being dead or non-viable and the conjugate diameter measuring above two and one-half inches. 2. Obstructed labor, due to monstrosity or to hydrocephalus. 3. Impacted shoulder presentation, impacted after-coming head, or irreducible face presentation, the fœtus being dead.

It will be noted that under these indications the proviso is made that the fœtus be dead, except when dealing with monstrosities. Our reason for such proviso is the belief, stringently insisted upon throughout this treatise, that, the maternal condition not contra-indicating in the manner sufficiently dwelt upon in the chapters on the Cæsarean section and symphysiotomy and pubiotomy, recourse to these operations will usually be justifiable, and embryotomy of the live fœtus rarely be so. This, at any rate, has become the modern rule in maternity hospitals.

In private practice the question still remains open to the choice of the patient, and will so remain until the Cæsarean section becomes as safe an operation as, in the hands of an expert, embryotomy should be. In a given case, however, it is the bounden duty of the physician to set the relative stand-points of the two operations impartially before the woman. Neither sentimentality nor religious training or belief should swerve. To speak as definitely as possible, the woman's chances of recovery under embryotomy are fully nine out of ten, but then she loses her child; under the Cæsarean section the chances against her are one in twenty, whilst the child's chances of survival are nine out of ten. This fair estimate is, of course, based on the assumption that the Cæsarean section is an elective one, and, further,—a point to be well noted,—that the embryotomy of the living fœtus is not an elective one, for embryotomy under this condition will never become strictly elective. Where the Cæsarean section is not going to be taken into consideration, the average physician, outside of a hospital, will attempt every other possible procedure before deliberately electing an operation which entails the taking of life, even though it be to save life. This is an absolutely erroneous working basis. Where the cause of the pelvic dystocia is recognized, our science is well-nigh exact enough to enable the properly-trained physician to predicate the chance of delivery of the live fœtus of average size by means of the non-mutilating minor operations. Therefore, due election is as possible in the case of embryotomy as it is in case of any other obstetric operation. There is no credit in delivering the woman by embryotomy when she is so exhausted as to have but slight chance of surviving the operation. In major dystocia, then, embryotomy of the living fœtus should be elected in order to avoid a single percentage of mortality-rate; else the maternal chances from the Cæsarean section are far better than from non-elective embryotomy. That is to say, where the choice between the two operations is based on an absolute indication, the one or the other must be deliberately elected. It is the border-line cases which will always call for the soundest judgment, and here, in the opinion of many, symphysiotomy or pubiotomy can stand between the Cæsarean section and embryotomy of the living fœtus. As has been amply emphasized, there is to-day left no ground for an elective embryotomy, certainly in hospitals. Under an absolute indication the Cæsarean section is safer for the woman than the difficult embryotomy, and under the relative indication pubic section narrows very strictly the indications of embryotomy. In the near future, then, the physician in private practice, as he is now in hospital practice, may be relieved of the duty of killing the fœtus in cases where, through an alternate operation, both woman and fœtus may be saved.

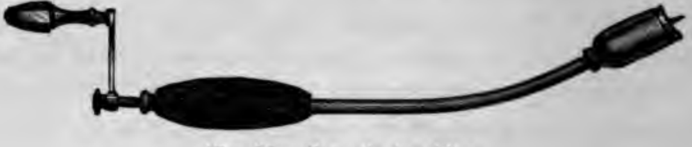


Fig. 95.—Braun's trephine.

1. *The Operation of Craniotomy.*—This operation, as the name implies, aims at diminishing the bulk of the fœtal skull. It is performed either on the before-coming or on the after-coming head. In the latter event it will rarely become a question of killing the fœtus, since the child will usually be dead before craniotomy is demanded. At best, craniotomy must be considered a difficult operation. The working room is slight owing to the contraction of the pelvis; for the same reason the cervix is rarely fully dilated; injury to the maternal parts is not an unlikely occurrence, and this traumatism increases greatly the risk from septic infection or, in any event, will complicate the convalescence.

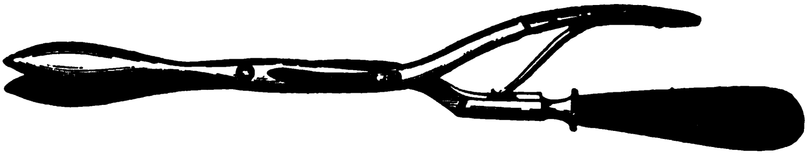


Fig. 96.—Blot's perforator.

The essential instruments requisite for the performance of craniotomy are: A trephine for perforation; a cranioclast for extraction. There are a number of types of perforators, such as Karl Braun's trephine, Blot's perforator, Martin's trephine, Naegele's scissors. Braun's and Blot's instruments are particularly useful in case the operation is performed on the before-coming head; the scissors answers best for the after-coming head.

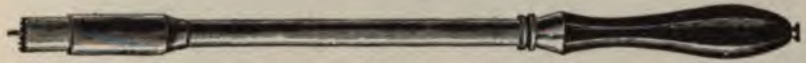


Fig. 97.—Martin's trephine.

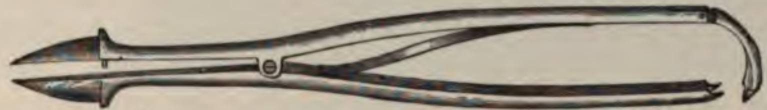


Fig. 98.—Scissors-perforator.

The head having been perforated, a sound (like the uterine or, better still, the metal urethral) is needed to break up the brain, and a syringe to wash out the contents of the cranium. This accomplished, the cranioclast or craniotractor—a better term, since it defines the purpose of the instrument—comes into play. The best instrument is thăt of Karl Braun.

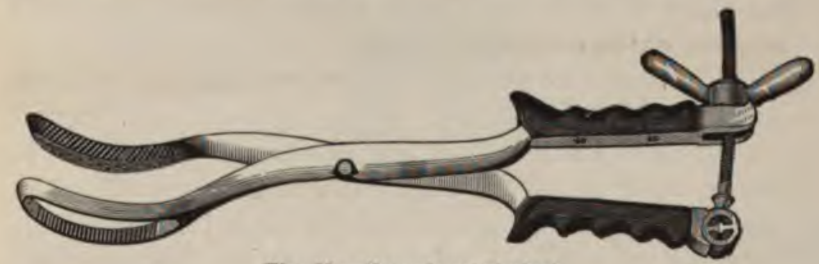


Fig. 99.—Braun's cranioclast.

The steps of the operation are the following: The external genitals having been thoroughly asepticized, the woman is placed on a table, the bed not sufficing for any of the major obstetric operations. The instruments are sterilized and the hands of the operator and of his assistant are carefully cleansed. Too much care in this respect is not possible, since the sole risk in expert hands to which the woman is subjected is septic infection. If the woman be not excessively nervous, and the operative indication be not an extreme one, anæsthesia is not absolutely essential. In view, however, of its safety, we always counsel it.

The bladder having been emptied by catheter, the woman is placed in the lithotomy position and we proceed as follows:—

(*a*) *Craniotomy of the Before-coming Head.*—The fœtal head should be steadied at the brim through suprabubic pressure made by an assistant. The operator determines the position of the head through vaginal examination and selects the preferable point for perforation. Either a parietal or the occipital bone will be accessible, and one or the other should be chosen, sutures and fontanelles being avoided. The fingers of the left hand are placed against the fœtal head to steady the trephine and to guard against injury to the maternal parts. The trephine is pressed firmly against the head, its handle is steadied by the operator's right hand, and the nurse or the second assistant turns the screw of the trephine until the head has been entered. The trephine is now removed and the metal sound is inserted into the cranium to break up the brain. The nozzle of the syringe or a glass irrigating tube, fitted to the syringe, next takes the place of the sound and the brain is washed out. (Plate XLV, Fig. 1.)

It has been contended that the preferable practice is now to leave the case to nature. We can see no advantage in this. The woman being anæsthetized, it is better to follow perforation with extraction. We thus avoid what may prove futile efforts on nature's part, and we thus forestall possible maternal exhaustion. The left or grooved blade of Braun's cranioclast is inserted into the opening made by the trephine; the other blade is applied to the outside of the skull, being guided into position by fingers of the

PLATE XLV.

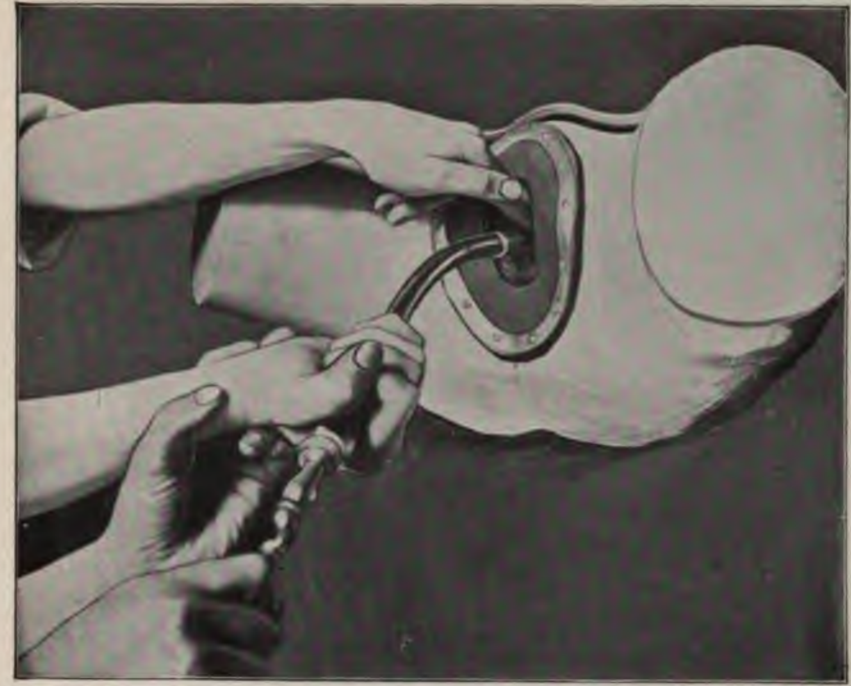


Fig. 1.—Trephining the Before-coming Head.

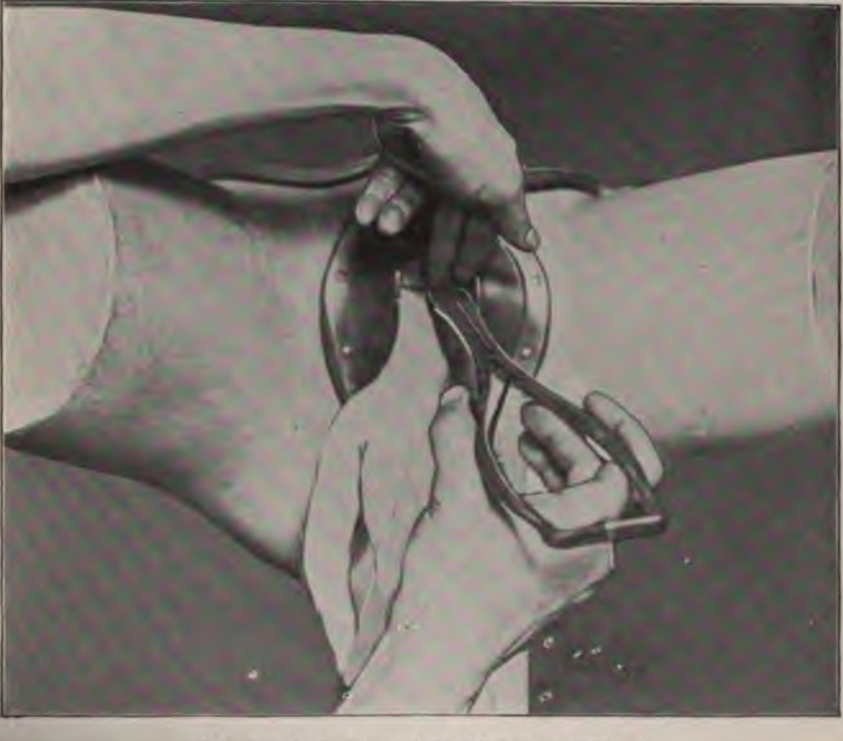


Fig. 2.—Perforation of the After-coming Head.

right or left hand, according as the blade is applied to the left or the right side of the pelvis. The blades are locked; the screw is turned home, which results in firm hold of the head being secured. Traction is made, even as with the forceps, in the axis of the pelvic brim until the head reaches the pelvic floor, and then in the axis of the pelvic outlet. The fœtus having been extracted and the placenta having been expressed, an intra-uterine douche of 2-per-cent. creolin or of 1 to 8000 bichloride solution is given.

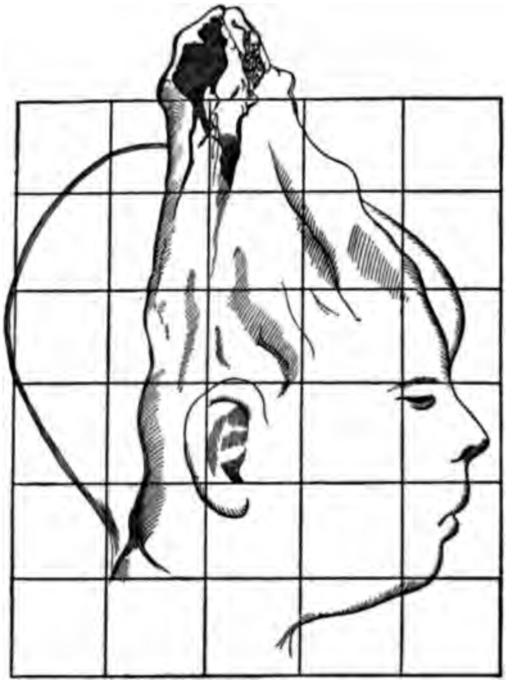


Fig. 100.—Effect of the cranioclast on the fœtal skull.

Where extraction by the cranioclast proves difficult owing to non-yielding of the occiput, the cephalotribe, as will be noted, should be substituted. It is to be remembered that extraction by the cranioclast is possible because, the cranial contents having been evacuated, traction on the head causes it to be compressed, and thereby diminished by the pressure exerted by the pelvic walls. Undue pressure is to be avoided in order to prevent, in turn, traumatism of the maternal parts.

(*b*) *Craniotomy of the After-coming Head.*—The operation on the after-coming head presents greater difficulties than that on the before-coming head. The trunk of the fœtus having been extracted, it is in the way of the necessary manipulations. Only exceptionally, also, will it be possible to elect the desirable point for perforation, this point being the occipito-atloid ligament. Further still, after perforation and excerebration, if the head be wedged tightly at the brim, the greatest possible care is requisite, in inserting the blades of the extractor, in order to avoid inflicting considerable traumatism on the maternal parts.

When possible to reach the occipito-atloid ligament, the scissors-perforator of Naegele is the best instrument. When the necessities of the case require perforation through the dense mastoid or occipital bone, the perforator of Martin or of Blot, being smaller than the trephine of Braun, should be selected.

The steps of the operation are as follow: After thorough asepsis of the genital tract and emptying of the bladder, one assistant steadies the head by suprapubic pressure, and a second pulls the trunk of the fœtus laterally, downward or upward, according as the operator has decided to perforate under the pubes, to one or the other side of the pelvis, or from below upward. If the occiput has been rotated under the pubes, as it ordinarily may, the operator determines with the finger the occipito-atloid articulation, and guides the scissors along this finger to the site. The finger must remain in position during perforation, in order to protect the bladder in the event of the scissors slipping. The wedge of the scissors having been entered at the articulation, pressure on the handles enlarges the opening into the cranium laterally, and next, by rotation of the scissors, similar pressure enlarges the opening antero-posteriorly. This having been effected, the scissors is removed and the metal sound is inserted for the purpose of breaking up the brain. The contents of the cranium are next washed out with sterilized water thrown in by the syringe. If the pelvic contraction be not marked and uterine contractions are active, the excerebrated head may be born spontaneously. As a rule, however, extraction by the cranioclast is essential. The left, grooved blade of Braun's cranioclast is inserted into the cranial cavity, the right blade is applied laterally, the instrument is locked, and the screw is turned home. Traction is made in the axis of the pelvic inlet or outlet, according to whether the head is in the cavity or on the pelvic floor. (Plate XLV, Fig. 2.)

If the position of the head is such that the occipito-atloid ligament cannot be reached, it becomes necessary to enter the skull through an opening made in one or another of the cranial bones, and then the scissors-perforator will not answer. Either Blot's or Martin's instrument is firmly applied to the point selected for perforation, and the skull is trephined. The other steps are similar to those just stated.

At times the fœtal head is exhausted at the outlet, so that practically we are dealing with an impacted face presentation. Under these circumstances the skull may be entered with the scissors-perforator through the roof of the mouth.

In case the hydrocephalic head is the cause of dystocia, insert a trocar or aspirating-needle in the spinal canal and thus evacuate the fluid. The head then collapses.

Exceptionally, owing to density of the cranium, it becomes impossible to extract with the cranioclast. Then, as will be noted, it becomes necessary to resort to cephalotripsy.

The operation of craniotomy having been completed and the placenta having been expressed, an intra-uterine douche of 2-per-cent. creolin or of 1 to 8000 bichloride solution should be administered. In the event of injury having been inflicted on the pelvic floor, the same should be repaired.

2. *The Operation of Cephalotripsy.*—The aim of this operation is to crush the skull in order to allow of readier extraction than is possible in certain instances by means of the cranioclast. The latter instrument is a tractor, pure and simple; the cephalo-

tribe is at the outset a crusher and afterward a tractor. Perforation is as essential an initial step as in a case of craniotomy. The advantage, therefore, which the cephalotribe has over the cranioclast is that, being a more powerful instrument, it enables the operator to overcome the difficulties in the way of delivery by the simple tractor offered by a dense and fully-ossified cranium. The cephalotribe, however, has the disadvantage of being a bulkier instrument than the cranioclast, and, further, occupies more space in the pelvis, since neither of the blades is applied within the cranial cavity. For this reason, therefore, the cranioclast is to be preferred whenever the emergencies of the given case will allow of its application.

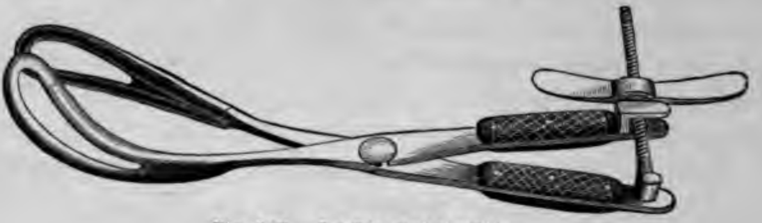


Fig. 101.—Lusk's cephalotribe.

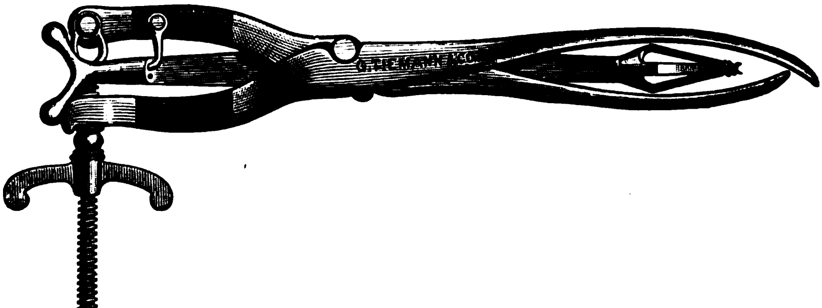


Fig. 102.—Tarnier's basiotribe.

Simpson, Hicks, Breisky, Lusk, and others have devised useful forms of the instrument. Lusk's cephalotribe, in most respects, will answer best where the instrument is indicated at all. Practically Tarnier's basiotribe will be found to take the place of either cranioclast or cephalotribe. The head is perforated by means of the central screw and the blades are then applied to the head and locked around the perforator. Obviously, since the cephalotribe is applied entirely between the walls of the pelvis and the fœtal head and since, further, the instrument, whilst diminishing the diameter of the head in one direction, increases it in another, it is applicable only when the operation is indicated in the presence of the minor grades of pelvic contraction.

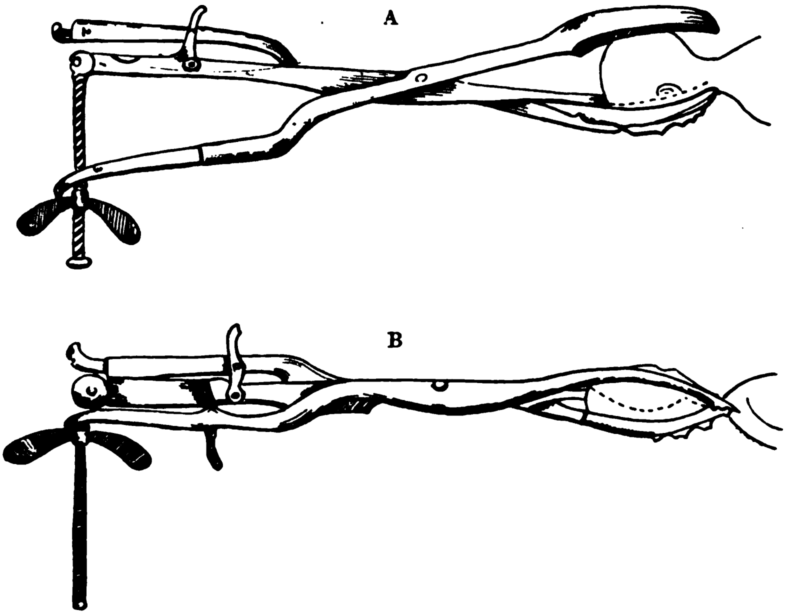


Fig. 103.—Basiotripsy. *A*, Head perforated and grasped. *B*, Head crushed.

Notwithstanding its advantages in certain cases, the cephalotribe is a more dangerous instrument than the cranioclast. Injury to the maternal parts is more likely, owing to the increased room in the pelvis its use entails; and, further, owing to the spicula of bone which are apt to project as the result of the crushing force applied. Still, the instrument is a most essential one in fortunately rare instances.

The initial steps of cephalotripsy are similar to those for craniotomy,—thorough asepsis of the genital tract, hands of operator and assistant and instruments, followed by perforation and excerebration. The blades of the cephalotribe are next applied accurately to the fœtal head, under the guidance of the fingers in the vagina. The screw is then turned home and the cranium is crushed, being elongated in the diameter opposed to that in which the crushing force is exerted. This latter point is ever to be borne in mind, so that during the process of extraction the enlarged diameter of the fœtal skull may be rotated, where choice exists, into the larger diameter of the pelvis. Extraction is made even as with the forceps, in the axis of the inlet, until the head reaches the pelvic floor, and then in the axis of the outlet. After delivery of the fœtus and the placenta, an intra-uterine douche of 2-per-cent. creolin or 1 to 8000 bichloride solution is to be administered, and any injury to the pelvic floor is to be repaired.

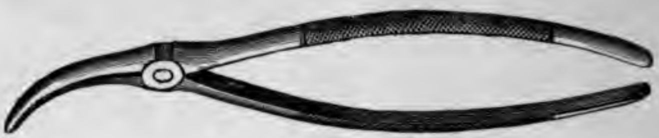


Fig. 104.—Bone-forceps.

3 and 4. *Evisceration and Decapitation.*—These operations are applicable to instances where the fœtus lies transversely in the uterus, and impacted to such a degree as to forbid version, for the purpose of bringing the fœtal head in such relation to the pelvic brim as to permit of craniotomy.

Evisceration is called for where the neck of the fœtus cannot be reached, whereas, when it can be reached, decapitation finds its sphere of action. Both these operative procedures must be considered as well-nigh the most dangerous of all obstetric operations.

Aside from the increased risk of direct traumatism to the uterus, in which organ, necessarily, the manipulations take place, the lower uterine segment is usually thinned, particularly in neglected cases, and, therefore, there exists considerable likelihood of rupture of the uterus.

Where the neck of the fœtus is not accessible and evisceration becomes the operation of necessity, the steps are as follow: After thorough asepsis of the genital tract, and similar precautions in regard to the hands of the operator, his assistants, and the requisite instruments, the scissors-perforator is guided along one or more fingers in the vagina to the most accessible portion of the fœtal trunk, is inserted to its full depth, and the opening thus made is enlarged by pressure on the handles. The metallic sound is next inserted into this opening, and the contained organs are broken up. This process is tedious and calls for extreme caution lest the sound perforate the fœtus, and thus inflict damage on the uterus. Whenever possible the finger of the operator should take the place of the sound. The cavity having been emptied of its contents, any projecting spiculæ of bone are removed by the bone-forceps, and then the fœtal trunk may possibly be bent on itself through traction

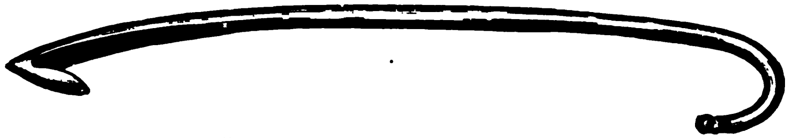


Fig. 105.—Crochet and blunt hook.

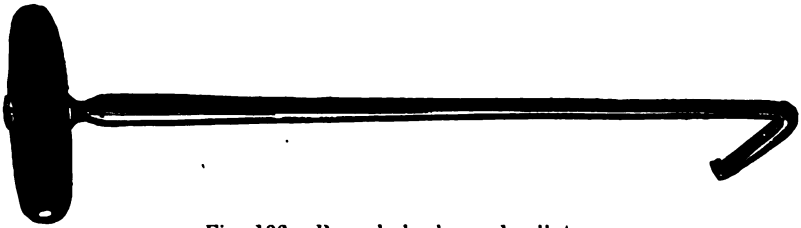


Fig. 106.—Braun's hook, or decollator.

applied by the blunt hook, and be thus delivered. Should this manipulation fail, the operator will be obliged to break the fœtus up further, dismembering it, and resorting to the cranioclast or to the cephalotribe for the extraction of the fœtal head. A number of complicated instruments, such as chain-saws, have been devised for use in these extreme instances; but they are one and all open to the objection that, being difficult to apply around the fœtal trunk, they are liable to inflict great damage on the maternal structures. A simple device is the following: When possible a sterilized gum-elastic catheter, threaded through its eye with a stout sterilized cord, is carried around the trunk of the fœtus. The catheter is unthreaded and removed, leaving the cord around the fœtus. The ends of this cord are brought out of the vagina through a cylindrical speculum, and then, by traction on the ends of the cord, the fœtal trunk may usually be sawn through. This failing, the sole alternative is to cut through the spinal column by the scissors. The name of *spondylotomy* has been applied to these procedures. Such an amount of traumatism is thus entailed that we question if, where the conjugate is diminished below two and three-fourths inches, it be not preferable to enlarge the pelvic diameters by symphysiotomy in order to obtain greater working space.

Where the neck of the fœtus is accessible decapitation is the operation of choice. A number of instruments, complicated to a greater or less degree, have been devised for the performance of decapitation. The simplest of all is the Braun hook, or *decollator*. This hook can be used in every instance where the more complicated apparatus can; it is serviceable where the latter is not, for the reason that if there is not space enough to pass the decollator it is likewise impossible to adapt the chain-saw; it is readily rendered aseptic and is less likely to injure the maternal parts than any of the other devices.

In an emergency, where the Braun instrument is not at hand, a stout sterilized cord may be carried around the fœtal neck by means of a sterilized elastic catheter; the ends of the cord are carried through a cylindrical speculum out of the vagina, and a see-saw motion associated with traction will sever the head from the trunk. Whenever possible, however, the Braun hook is to be preferred, and the steps of the operation are as follow: The bladder is to be emptied. The genital tract, the hands of the operator and of his assistants having been carefully asepticized, the fœtal arm is brought down out of the vagina and handed to an assistant, who, through the exerted traction, steadies the fœtal neck at the brim and makes it more accessible. It is desirable to exert traction on this arm by means of a tape or a towel tied to it, otherwise the assistant will be in the way of the operator.

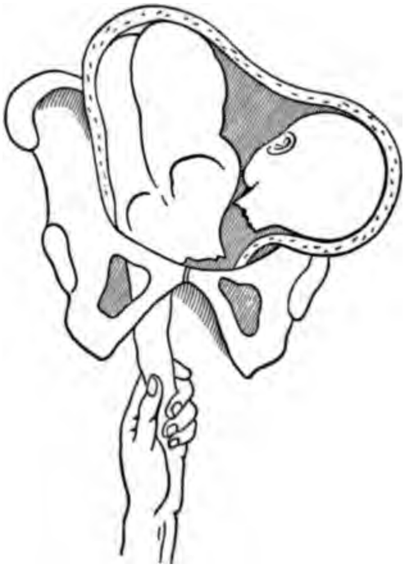


Fig. 107.—Delivery of trunk after section of head.

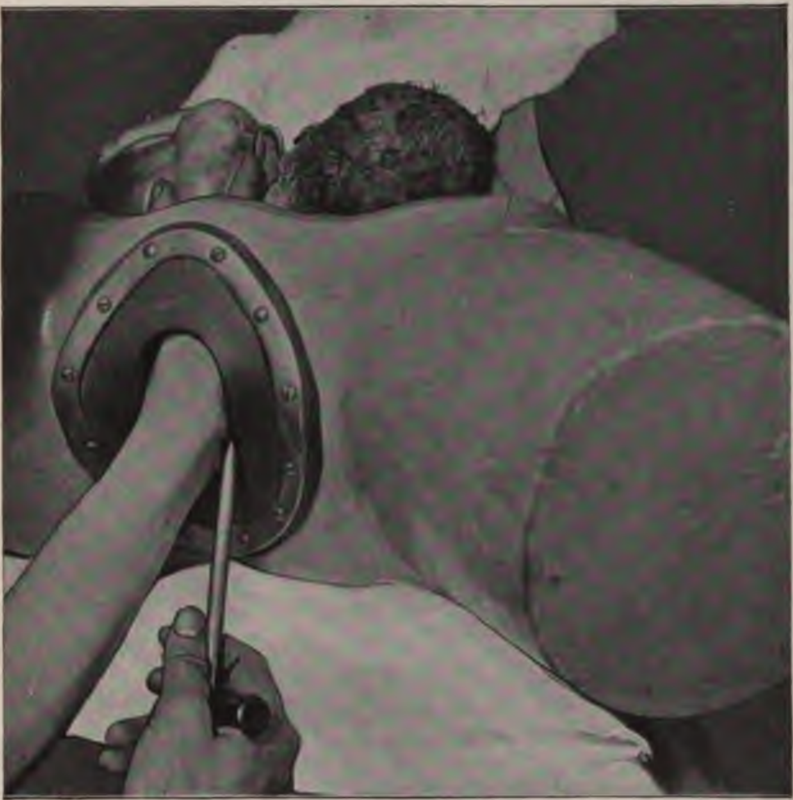
The aim of the operator is to pass the hook around the neck of the fœtus, and this is accomplished as follows: Inserting two fingers of the right or the left hand (according as the fœtal head occupies the left or the right half of the pelvis) into the vagina, the hook is passed flat along these fingers until the neck of the fœtus is reached. The point of the hook is then guided around the neck by these fingers from above downward, in order to lessen the risk of injuring the bladder. (Plate XLVI.) Firm traction is then made on the hook in order to assure a thorough hold on the neck, the fingers remaining in place so as to certify that the point of the hook is not injuring the maternal parts. The hook is rotated, traction being maintained until the neck is felt to yield through the breaking of the spinal column. As a rule, the soft parts also are thus severed, and the hook is removed along the fingers. If the hook has failed to sever completely the muscular attachments, the scissors, guided along the fingers, must be utilized.

The neck of the fœtus having been severed, traction on the prolapsed fœtal arm will ordinarily serve to deliver the trunk, the fœtal head slipping upward. The next step is to remove the head.

If the indication for decapitation has been an impacted transverse position of the dead fœtus, in a pelvis where there exists no special disproportion between the pelvis and the fœtus, the forceps will answer for extraction. The head being steadied at the pelvic brim by an assistant, the forceps is applied in the usual manner, and delivery is effected under the rules applicable to the forceps operation.

Where, however, there exists dystocia due to contracted pelvis or to large fœtus, the manipulations become more difficult according to the degree of dystocia. The method of inserting the blunt hook into the cranium through the foramen magnum and delivering by traction has been advocated, but should be rejected owing to the risk of the hook's slipping and injuring the maternal parts. The preferable method is the following: If the head can be fixed at the brim with the foramen magnum presenting toward the vagina, then excerebration by the metal sound and extraction by the cranioclast or the cephalotribe is advisable. If the head cannot be so fixed, then perforation by the trephine or the scissors-perforator is demanded, followed by extraction by the cranioclast or the cephalotribe. The risk to the maternal parts is here great, owing to the fact that the point of impact of the trephine or scissors can rarely be at a right angle, and there is, therefore, great danger of the

PLATE XLVI.



*Insertion of Braun's Decollator.*

instrument's slipping. If the pelvis be large enough to permit of its introduction, Tarnier's basiotribe will answer admirably.

The uterus having been emptied, a 2-per-cent. creolin or a 1 to 8000 bichloride douche should be administered, and lesion of the genital tract be repaired as completely as is possible.

Aside from impacted transverse presentation, decapitation may be called for in case of locked twins.

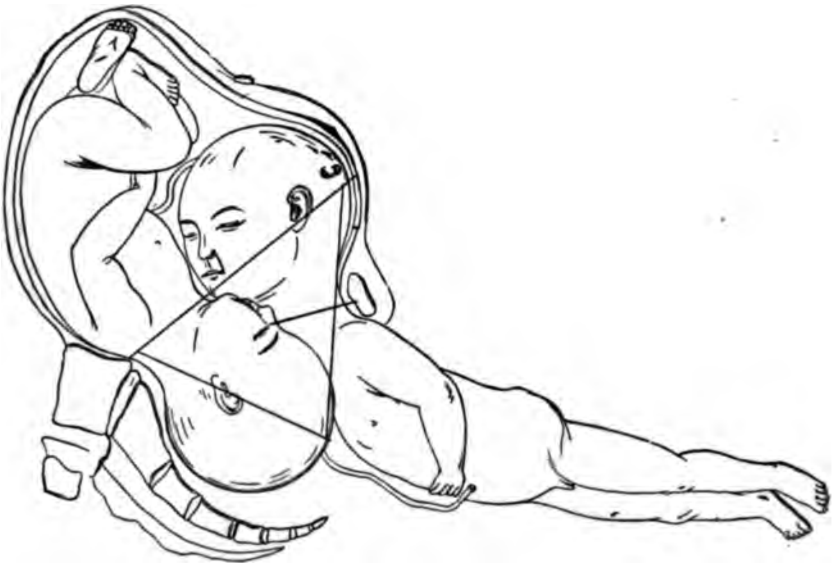


Fig. 108.—Locked twins.

The trunk of one fœtus having been born, and it being found impossible by manual and postural treatment to decompose the wedge formed by the fœtal heads, the only possible resource is the sacrificing of the first fœtus—in case it be not already dead—in order to give the second fœtus a chance of life; for it is the first fœtus, the trunk of which is born, whose life is most endangered. The steps of the operation do not differ from those just stated.

5. *Cleidotomy.*—This operation consists in the cutting through one or both clavicles. It is applicable to conditions where the head is in the world and large shoulders are the cause of the dystocia.

Heavy scissors are used to cut through one or both clavicles, the shoulders collapse and the trunk may be delivered.

6. *Cranioclasty or Basiotripsy to the Breech.*—This operation is applicable to a high impacted breech and a dead fœtus. The anus is incised with scissors, the blade of the Braun cranioclast is inserted over the sacrum and the trunk delivered, followed where necessary by cranioclasty of the after-coming head.

### PROGNOSIS OF EMBRYOTOMY.

It is not possible to state specifically the death-rate from embryotomy. The statistical data at disposal are useless, because of the fact that many of the records include operations performed before the stringency of asepsis was recognized, and, further, because the operation, except under absolute indication, has rarely been one of election. It is a significant fact that the mortality following embryotomy is higher in private than in hospital practice. The reason is that in the former practice the temptation is to test the method of delivery by forceps and version before resorting to embryotomy; often because accurate mensuration of the pelvis having been neglected, the practitioner is unaware of the cause of the dystocia till his eyes are opened by the fact that the methods of delivery with which he is most familiar are of no avail. Embryotomy is then resorted to on an exhausted woman with genital tract already damaged, to a greater or less degree, by the futile efforts at delivery by methods which the mechanical problem forbid. Deliberate election of embryotomy, where one or another cutting operation is refused, on the other hand, is more likely to be the rule in hospitals, and, therefore, the mortality is lower. Further still, the mortality depends on the indication for the operation selected. Where the dystocia is not extreme and the operation, therefore, not a difficult one, the sole risk entailed by embryotomy is sepsis. In the higher degrees of dystocia, particularly where evisceration is called for, the mortality must always remain relatively high owing to the lesions which, even in the hands of the most expert, the maternal parts are likely to incur.

Minor lesions, such as lacerations of the cervix or of the pelvic floor, if repaired at once and aseptically, are not likely to enter as complications of the puerperal state. Neither are fistulæ, if the result of direct traumatism and not of sloughing following prolonged pressure. The major risk the woman runs is rupture of the uterus,—a not unlikely accident where embryotomy is demanded in a justo-minor pelvis of high grade through an undilated cervix. Whilst, indeed, embryotomy may prove a very simple operation, it may also become the most difficult of all the obstetric operations. For this reason, when the child is alive, it has become the custom in hospitals to weigh carefully the chances in the boundary-line cases of Cæsarean section and of embryotomy. It becomes a question not, as is often erroneously argued, of the greater value of one life over another; it becomes a question of the deliberate, scientific election of that operation which subjects the woman to the least risk. There is no doubt but that difficult embryotomy, in the hands of the non-expert, subjects the woman to greater risk than does the Cæsarean section, provided always that the physician is familiar with the simple technique of the latter operation, as he should be, if competent to attend the lying-in woman at all.

# CHAPTER XIX.

## THE SURGERY OF THE PUERPERIUM.

THE puerperal state begins with the expulsion of the placenta, which event terminates the third stage of labor. In case surgical interference has been required during the course of labor, the genital tract has likely enough suffered certain lesions which it becomes the duty of the physician to repair. As a rule, the surgery requisite may be denominated minor, with the exception of one complication,—rupture of the uterus.

In the event of labor or the surgical interference not having been conducted aseptically, there will develop, during the course of the puerperal state, a number of complications, which may also require surgical intervention, and, as a rule, this surgery is of a major nature.

The operations, then, which we are called upon to consider depend either on traumatism, avoidable or unavoidable, or on sepsis, which, from the modern stand-point, must be looked upon as almost always avoidable.

The operations resulting from traumatism are the following: 1. Laceration of the cervix. 2. Laceration of the pelvic floor. 3. Fistulæ. 4. Rupture of the uterus.

The affections depending on septic infection which may demand surgical interference are: 1. Endometritis and metritis. 2. Pelvic abscess. 3. Peritonitis. 4. Mastitis.

### IMMEDIATE REPAIR OF THE LACERATED CERVIX.

It is only of late years that it has been considered desirable to attempt the immediate repair of the lacerated cervix. The objections to the operation have been the problematical result as regards primary union and, further, the belief that it was impossible to resort to the operation without the presence of a number of assistants. There are now a sufficient number of cases recorded to warrant the assertion that primary union may usually be expected, and if the technique we proceed to describe be followed skilled assistants are not necessary. On the other hand, the primary operation shuts off one of the avenues of sepsis, and removes at once one of the most frequent causes of subinvolution, as well as, in case of union, relieves the patient of the necessity of the secondary operation. The fact that many of the teachers of obstetrics, whilst admitting the advisability of the immediate operation, state that they do not consider it safe to teach it to students, is a sad commentary on certain methods of instruction. The student should simply not be graduated who is not qualified to perform that operation which leaves the woman in as good a condition as she was before the receipt of the lesion, allowing for the limitations of art. If the immediate operation be not selected, at any rate the intermediate should be, that is to say within a fortnight after delivery.

The immediate operation is either one of election or one of strict necessity. It becomes one of necessity when, either after spontaneous labor or after operative interference, profuse hæmorrhage occurs and continues, which, on investigation, is found to be due to a cervical tear involving a circular artery. Here the only other resource is tamponing the vagina, which is unscientific as well as often nugatory. The operation becomes one of election in the lesser degrees of laceration. Unquestionably many such lacerations heal spontaneously, probably the vast majority if the course of the puerperium is aseptic. Still, we question if, where the laceration exceeds what may be termed the first degree, the patient has not the right to expect her physician to leave her in the best possible condition, in order to save her from the grasp of the gynæcologist later.

In case the operation is called for on account of laceration involving the circular artery, there exists no contra-indication. The immediate safety of the woman demands it. There are contra-indications to the performance of the operation in the presence of the lesser grades of laceration. If the woman is exhausted from prolonged labor, or if, owing to post-partum hæmorrhage, it has become necessary to use the uterine tamponade, then resort to the operation is either inadvisable or impracticable.

The instruments requisite for the performance of the operation are the following: A strong vulsellum forceps, a needle-holder, and a few large curved needles, preferably the Hagedorn. If the vulsellum be not at hand, it is simply necessary to carry a strand of silk-worm gut, threaded on a full curved needle, through the lips of the cervix. These serve as tractors. The preferable suture material is silk-worm gut. Catgut is unreliable, since it is apt to dissolve too soon and, furthermore, because the knot is apt to slip. The silk-worm gut is readily sterilized by boiling for a few minutes, and may be left *in situ* for weeks, as may be requisite, if, at the same time, it is necessary to repair the pelvic floor. A speculum is not strictly requisite, since, according to the technique about to be described, the operation is performed without one. The main advantage in dispensing with a speculum is that thus an assistant to hold it is not required. If the operator happen to have an Edebohls speculum with him, however, the counter-weight may be obtained by means of a flat-iron, which is to be found in every household.

The steps of the operation are the following: The woman is brought to the edge of the bed; the bladder is emptied; anæsthesia is only requisite in case the woman is excessively nervous. If the requisite assistants—two in number—are present, each may support a leg; but, in the event of these assistants not being present, the physician may use a sheet as a leg-holder by passing it around the knees and tying it to the patient's arms. The requisite instruments, having been sterilized by boiling, are placed handy to the operator's right hand, a lighted candle or lamp, in case the gaslight is not sufficient, being held by the nurse or by some relative so as to illuminate the field of operation thoroughly.

The operator seizes the cervical lips firmly with the double tenaculum, and pulls the uterus downward until the cervix is at the ostium vaginæ. The object of this traction is twofold: In the first place, the laceration is thus made accessible for operation, being performed under the guidance of the eye, and, in the second place, when the uterus is thus pulled downward, it is a well-known fact that hæmorrhage from the organ is, in a measure, checked. For this reason the technique described is preferable to that which entails operating through the Sims speculum, when the hæmorrhagic flow which always exists after the completion of labor renders the operation difficult by interfering with the field of vision. The next step is to pass the first and the most difficult of the stitches, which, once in place, gives the operator full control. A Hagedorn needle threaded with silk-worm gut is passed deeply, at the angle through the posterior cervical lip, under the lacerated surface, emerging in the canal. It is reinserted into the anterior lip at the canal, and emerges at the angle of the tear in the anterior lip. The remaining stitches are inserted in a similar manner, first on the one side, and next on the other, until the raw surfaces of each lip

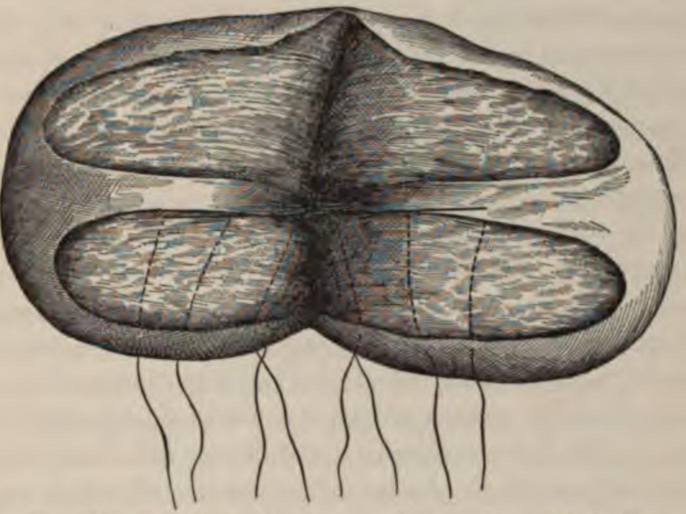


Fig. 109.—Sutures inserted on one side of a lacerated cervix.

have been approximated. The sutures are next tied. It is important to remember that it is essential to tie the stitches tighter after the primary operation than after the secondary, when the aim is simply to bring the denuded surfaces in apposition. After delivery, the cervix is always œdematous to a greater or less degree, and, if the stitches be not tied tightly then, in the course of a few days, when the œdema disappears, the stitches will necessarily be slack and deep union by first intention is unlikely. It is to the neglect of this precaution, we believe, that failure after the primary operation may often be traced.

The sutures having been tied, the vulsellum forceps is removed and a hot 2-per-cent. creolin douche is administered. The average time requisite for this operation is ten minutes. In case of failure in obtaining union, the woman's condition is none the worse for the attempt made to leave her in the best possible state, whilst, if union do occur, the woman is spared many of the ills which a lacerated cervix sooner or later entails. There is a further phase of this question which it is well to dwell upon. If the immediate operation be not performed in case of deep cervical laceration, dense cicatricial tissue inevitably forms; so that when the secondary operation is called for there is not alone much more difficulty in performance, but, in the opinion of many, it may even become, not a question of mere repair of a laceration, but one of amputation,—a more radical operation. We believe that before long it will be recognized as desirable to perform immediate trachelorrhaphy, as it is to-day considered a sign of incompetency if repair of the pelvic floor is not attended to immediately, in the absence of contra-indication.

The stitches in the cervix may be left *in situ* from ten days to a number of weeks, according to the necessities of the case. The longer interval is requisite where it has also been necessary to operate on the pelvic floor. If the stitches are aseptic, as they should be, when introduced, they can give rise to no possible trouble during the puerperal state. The assumption that they may interfere with drainage of the lochia is untenable, since the operation simply restores the cervix to the shape it has where laceration has not occurred. It goes without saying that we presuppose that requisite care has been taken not to sew up the cervical canal.

## IMMEDIATE PERINEORRHAPHY.

The conscientious physician aims to leave his patient, after confinement, with the pelvic floor in as sound a condition as art can make it, in the event of its having been lacerated during the process of delivery. There is little need at the present day to dwell on the untoward sequelæ which inevitably follow in the train of unrepaired lesion of the pelvic floor. The laity, as well as physicians in general, recognize the necessity of the primary operation,—so much so, indeed, that the former consider their medical attendant blameworthy who has failed to recognize a lesion, and thus neglected to repair it. The student need not have the fear that, if the lesion occur, it will be laid to his lack of skill. The practitioner who claims that, in an extensive practice, he has never seen a lacerated perineum has become to-day a *rara avis* in the light of the recorded experience from hospitals which certify to the necessarily frequent occurrence of lesion even in the hands of the most expert. The proper spirit to-day is to fear the blame which deservedly attaches itself to the attendant who neglects the performance of the primary operation whenever the conditions contra-indicating are absent.

The routine practice, after the completion of the third stage of labor, should be to investigate by sight, as well as by touch, the pelvic floor. There may be no apparent lesion externally, and yet, on separation of the labia, the most dangerous of all lesions, as regards its after-consequences, will be detected. It is now firmly established that the mere external tears are of no consequence beyond opening an avenue for the entrance of germs. It is the tears which involve the muscles and fascia of the pelvic floor which entail ultimately rectocele and cystocele, with their sequelæ. Too much stress, therefore, cannot be laid on the necessity of separating the labia and examining the pelvic floor.

The sole contra-indication to the immediate operation is exhaustion of the woman to such a degree, from prolonged labor or from post-partum hæmorrhage, as to call for absolute and immediate rest on her part. Of course, where, owing to post-partum hæmorrhage, it has been necessary to resort to the gauze tamponade of the genital tract, the operation cannot be performed. In the event of the woman's condition not permitting the immediate operation, the intermediate should be performed, that is to say within a fortnight after delivery. It is then only necessary by means of a sharp curette or with scissors to freshen the lacerated surface and to pass the sutures *lege artis*. Where the lesion, at best, requires but a few stitches, anæsthesia is not requisite, since the sensibility of the pelvic floor has been largely diminished from pressure associated with delivery. But, if the tear be one of a major degree, anæsthesia is desirable in order to enable the attendant to perform the operation with the requisite care as well as in order to save the woman unnecessary pain.

The instruments requisite are the following: A pair of scissors, a needle-holder, a few curved needles (preferably the Hagedorn). Material for suture will differ according to individual preference, but the silk-worm gut possesses all the advantages of silver wire or catgut, and has none of the disadvantages of the latter. Where the tear is chiefly internal, catgut, if its asepticism can be depended upon, answers admirably, since it is possible to use it as a running suture; but even then it may dissolve before deep union is secured, or, notwithstanding the precautions taken, it may prove the source of local sepsis. As for silver wire, it possesses no advantage for the primary operation over silk-worm gut, and requires infinitely more time for adjustment as well as more instruments. Silk-worm gut is readily sterilized by boiling, and, if aseptic, it may be left *in situ* for an indefinite time.

The method of operating will be modified according to the character of the laceration. The average text-book confuses the reader by the description of one or another operation as being the preferable. *The suturing must be adapted to the tear.* The most complex operation, of course, is demanded where the laceration extends through the sphincter ani, to a greater or a less extent, up the rectal wall. In the lesser grades the suturing usually will be almost entirely within the vagina. Before proceeding to operáte the physician should make a careful examination in order to determine the manner after which the pelvic floor has been injured, in order to secure deep union and proper approximation of the fascia and muscles. The ancient method of simply passing the sutures in at one side and out at the other will not stand the critical test of modern methods, for the day has gone by when securing a skin perineum is deemed sufficient. The parts operated upon must not alone look well, but must also subserve their intended purpose well.

Where the laceration has not extended through the sphincter of the anus the steps of the operation are as follow: The woman is brought to the edge of the bed, the legs are flexed on the abdomen and are held there by the nurse, or, if she is needed for other purposes, a sheet may be passed under the knees and each end tied to the patient's arms. As a rule, except in the minor degrees of laceration, anæsthesia is requisite. In order to avoid sponging, the field of operation may be irrigated to advantage by a weak solution of bichloride. Creolin is objectionable for irrigating purposes, since, owing to its color, it interferes with a good view of the field of operation. An assistant or the nurse, with aseptic hands, separates the labia so that the operator may determine the extent of the laceration. With the scissors jagged ends of tissue are cut off, thus securing an even surface for union. If the laceration has extended chiefly into one sulcus, as is not infrequently the case in the lesser degrees of lesion, a running catgut suture may be used to advantage. The needle is inserted at the apex of the tear, deeply, so as to secure as much of the divided fascia as possible, and the gut is tied. The over-and-over stitch is now rapidly taken, the needle on each occasion it is inserted being made to enter deeply, until the external end of the laceration has been reached, when it is tied. Occasionally the tear involves both sulci, in which event the process is repeated on the other side. In order to see well, the upper vagina is tamponed with sterilized gauze, which prevents the trickling of the uterine discharges.

In general, however, Hegar's method of operating (modified to suit the case) will give the most satisfactory result, even though its performance takes more time than that which we have just described.

The method is peculiarly applicable to the vast majority of lacerations, since these begin in the median line and extend laterally. The suturing is almost entirely internal, and approximates accurately the divided ends of the muscles and fascia, the aim which is essential in order to properly repair the lesion.

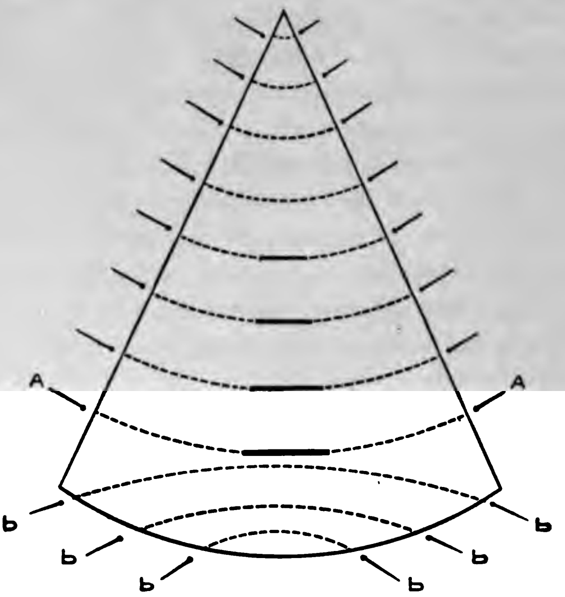


Fig. 110.—Insertion of sutures. *A*, *A*, intra-vaginal sutures; ***b***, ***b***, **external** sutures. (After Hegar.)

The needle is inserted at the margin of the tear near its apex, and passed deeply around to the opposite side. Similar sutures are inserted at an interval of about a quarter of an inch apart, till the tear has been approximated down to the carunculæ myrtiformes. The sutures are then tied and cut short. The superficial tear remaining is brought together by two or more sutures. Silk-worm gut answers admirably, and, if need be, a few interrupted sutures of catgut may be inserted. These sutures, if aseptic, may remain in place for a week or ten days. If there exist much œdema of the pelvic floor, the result of protracted labor, the precaution must be taken to tie the sutures a trifle tighter than is the rule for plastic work; otherwise, on the disappearance of the œdema, the sutures will be relaxed and deep union will not be secured.

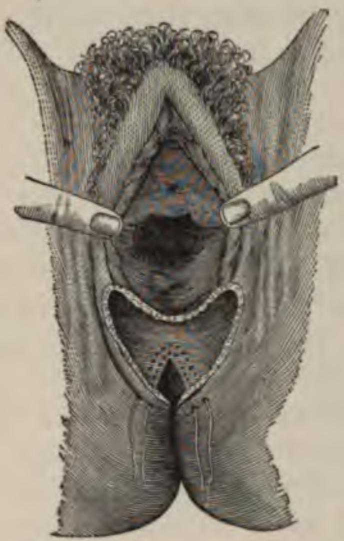


Fig. 111.—Laceration through the sphincter. Sphincter-sutures in place.

Where the laceration has been so extensive as to involve not only the pelvic floor, but also the sphincter ani and the recto-vaginal septum, there is all the more call for the immediate operation, and the procedure is proportionately more complicated. It is, above all things, important to bring together the torn ends of the sphincter ani, for otherwise the woman will suffer from incontinence of fæces to a greater or less degree, and will, in consequence, inevitably require the secondary operation. In this operation we still prefer the silk-worm gut for suture purposes. It holds just as well as silver wire, and is a source of less discomfort to the woman. The first stitches to be inserted are the rectal. The needle is inserted below the margin of the tear and is carried deeply outward so as to grasp the torn ends of the sphincter. It circles around the recto-vaginal septum and emerges at the opposite side, grasping the other end of the sphincter. As a rule, two sutures are requisite to secure the sphincter-muscle, and when inserted these may be tied. The laceration of the pelvic floor is then repaired according to the method just described.

Exceptionally, the laceration occurs directly through the perineum, giving rise to what is termed central laceration. In case of this accident, the method of procedure consists in converting the central laceration into a complete, by slitting through the bridge of tissue remaining between the laceration and the pelvic floor, and then repairing the lesion after the method described.

If the steps of the operations just described are aseptic, the management of the puerperal state does not differ materially from the normal. It is unnecessary to administer vaginal douches, since the non-septic lochia will not interfere with union. The old-time rule of keeping the bowels constipated is not deemed good practice to-day. The comfort of the puerpera demands that the intestinal canal should not be allowed to become clogged, and the perineal tear is more likely to heal from the depths if we take precautions to prevent hardened fæcal matter from collecting in the rectal *cul-de-sac.* The diet should consist of broths and kumyss or its derivatives. After thirty-six hours steps should be taken to move the bowels. A full dose of castor oil or two drachms of the compound licorice powder answer well. Enemata or other means of interfering with the anus should be avoided. A retention catheter is inserted into the bladder for three days, a few ounces of boric solution being thrown in every five hours. Urotropin should be administered in ten-grain doses every six hours to keep the urine sterile. The coaptated surface may be kept powdered with iodoform, aristol, or boric acid, and the nurse should be strictly enjoined to exercise scrupulous cleanliness of the external genitals. For the first few days the woman had better be catheterized, or else, and this we prefer, when she passes water it should be under the administration of a weak creolin or bichloride douche. It is very questionable if the normal urine will interfere at all with primary union.

In the event of the primary operation proving a failure, the woman should be advised to submit to the secondary operation as early as may be, for the longer she waits the greater the cicatricial tissue, and the more aggravated the rectocele and possibly the cystocele which will form.

### Fistulæ

Only exceptionally, nowadays, are fistulæ of the genital tract encountered, for the reason that their chief causes are not allowed to act. Protracted labor was formerly responsible for the majority of fistulæ. Traumatism, except in the presence of a major degree of pelvic contraction when surgical interference was demanded, was rarely a causative factor. It is only when a fistula forms as the result of surgical interference that the physician, in the capacity of accoucheur, will be called upon to perform immediate operation. The fistulæ which result from prolonged pressure of the fœtal presenting part on the pelvic floor rarely make themselves evident until a number of days after labor. The process is purely one of sloughing in these latter instances. Of course, here, as well, it is eminently necessary to take measures for repair of the lesion as soon as the condition of the woman will allow, since the formation of extensive cicatrices will render the operation most difficult and the result problematical.

In view of the difficulty of the secondary operation for fistula, it may at first sight seem useless to attempt repair immediately after delivery. When we remember, however, the untoward sequelæ of both urinary and fæcal fistulæ, and the repeated attempts which are often requisite before union can be secured after the secondary operation, there is little need of dwelling further on the desirability of aiming at primary union. The main reason why the primary operation is difficult is the impossibility of placing the recently-delivered puerpera in the best position for performing the operation, particularly when the fistula affects the bladder. This, indeed, will prove a distinct contra-indication when the fistula is seated high up; but when the lesion is low enough down to enable the physician to bring it into view without placing the woman in the genu-pectoral position, the attempt at primary repair should always be made. Rectal fistulæ may ordinarily be exposed with less difficulty than the vesical.

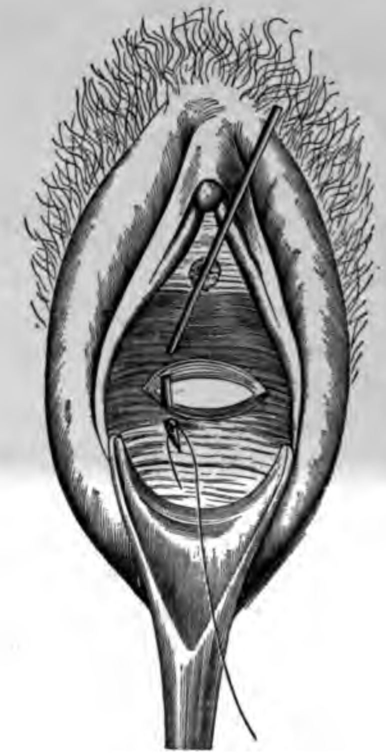


Fig. 112.—Repair of a vesico-vaginal fistula.

The steps of the operation either for rectal or vesical fistulæ do not differ from those requisite for the performance of the secondary operation. To prevent the lochia from trickling down and interfering with the field of vision, it suffices to pack the upper portion of the vagina with sterilized gauze. Since there is no cicatricial tissue and, consequently, no special tension to be overcome, silk-worm gut will answer for suture purposes.

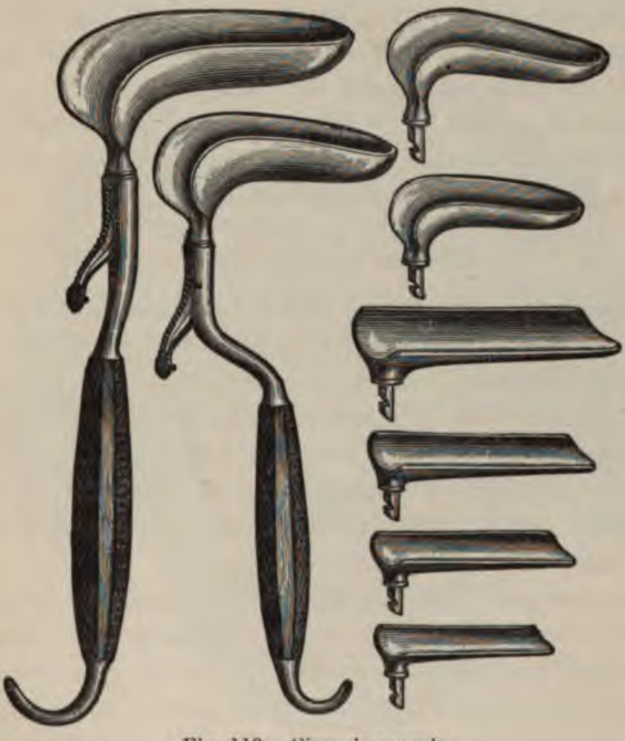


Fig. 113.—Simon's specula.

If the fistula is at all accessible with the woman in the dorsal position, the edges are made tense by traction with a tenaculum, and the sutures are inserted one after another from one edge of the fistula out at the other. T ie care is requisite, as in the secondary operation, not to p tches through the vesical wall. Coaptation of the torn edge ccurate and the stitches must be tied more tightly than ry operation, because when any œdema present has disappeared the stitches will otherwise become relaxed.

The after-treatment will not differ from that of the normal puerperium. The bowels should be kept fluid, and where the lesion has involved the bladder the catheter should be passed at least every six hours for three days. As is the rule for the puerperal state, the catheter must be passed by sight, and this is preceded by careful disinfection of the external genitals and the vestibule. If the sutures be aseptic they will not suppurate, and they should be left in place for fully two weeks. Should the primary operation fail, the woman should be advised to have the secondary operation performed without overmuch delay.

### RUPTURE OF THE UTERUS.

Rupture of the parturient uterus constitutes one of the most fatal as well as most alarming of the obstetric complications. There is scarcely an emergency which calls for more rapidity of judgment and of action; for, as will be noted, on prompt differential diagnosis and equally prompt treatment the life of the woman depends. The accident, fortunately, is an infrequent one, and will become all the more so as the benefits of strictly elective obstetric surgery become uniformly recognized.

The etiological factor cannot be always positively determined. In many instances rupture may be traced directly to the premature and injudicious administration of ergot; again, the causal factor is the attempt to drag a fœtus through a pelvis where attention to the ordinary rules of pelvic mensuration will teach that delivery by one or another method is alone possible; further, a by no means infrequent factor has been protracted labor with consequent thinning of the lower uterine segment; and, finally, the operation of embryotomy through a greatly contracted pelvis may be associated with rupture of the uterus. In certain instances none of these factors can be held responsible when, in default of a better reason, we must consider that the uterus has become weakened at a certain point, and has simply given way at the point of least resistance.

There are two varieties of rupture of the uterus, and on their differentiation depend both the prognosis and the treatment. These varieties are complete rupture and incomplete rupture.

The complete rupture is intraperitoneal; the incomplete rupture is extraperitoneal. The clinical history will ordinarily enable the physician to differentiate the variety of rupture, and the importance of accurate differentiation will shortly be apparent.

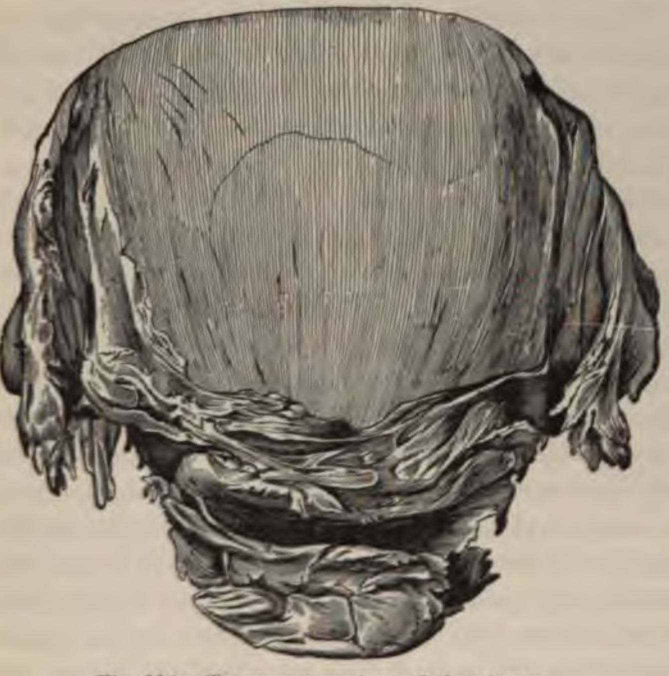


Fig. 114.—Transverse rupture of the uterus.

Incomplete rupture of the uterus may occur into either of the broad ligaments, or into the utero-vesical space, or into the *cul-de-sac* of Douglas. In any case the tear does not extend into the peritoneal cavity.

Complete rupture of the uterus necessarily invades the peritoneal cavity associated with, in general, the escape of the fœtus in part or in whole into this cavity.

In incomplete rupture the shock is less and the loss of blood is limited by the capacity of the cavity into which it is effused.

In complete rupture with extrusion of the entire fœtus into the peritoneal cavity the shock is great, and the hæmorrhage which may take place is only limited by the amount of blood the patient has to lose. Where a portion only of the fœtus is extruded, the amount of blood lost may be checked by the part of the fœtus which is not extruded acting as a tampon.

The signs which lead to diagnosis of rupture of the uterus are like those which are associated with hæmorrhage. These signs will vary in intensity according as the hæmorrhage is sudden and great or slow, even though gradually progressive. Shock, rapid pulse, pallor, sighing, eventually syncope,—such are the symptoms which should awaken the keen anxiety of the physician. The only positive way of making the differential diagnosis between complete and incomplete rupture is to insert the hand into the uterus, excepting, of course, in those instances where the fœtus escapes into the peritoneal cavity, when, so to speak, the diagnosis is made for us.

If the rupture is incomplete, surgical treatment is not demanded, certainly at the outset. The proper course to pursue is one of expectancy. Where the rent extends from the angle of a lacerated cervix into the base of the broad ligament, the hæmorrhage, in great part, comes from the circular artery, and this may be checked by carrying a suture around the artery and tying it. Where the rent involves the broad ligament or the anterior or the posterior *cul-de-sac*, the firm tamponade with sterilized gauze may check the hæmorrhage and limit its extension. Often, however, the blood will continue to be effused until it has dissected the cellular tissue as far as its anatomical boundaries in the given region will allow. In other words, the condition becomes one of hæmatoma—ante-uterine, retro-uterine, or lateral—into the broad ligament. Later on, if the hæmatoma do not become absorbed, or if, through some faulty technique, suppuration set in, surgical interference may become necessary. Where the rupture is intraperitoneal the prognosis, in any event, is most gloomy. If the fœtus has escaped entirely or in greater part into the peritoneal cavity, the only possible operation is an abdominal section, not in the hope of saving the child, but in order to give the woman a single chance of life. There is no time in this emergency for special preparations. The physician must have the courage of his convictions; he must open the abdomen at once, extract the fœtus, and treat the uterine rent by sewing it up after the manner pursued in the Cæsarean section, or by removal of the entire uterus as is described under the Porro operation.

Where the rupture is complete, but the fœtus has not escaped into the peritoneal cavity, there is scope for difference of opinion as to the proper treatment. The results from either of the methods which may be selected are the reverse of brilliant, although possibly of late years one of them has seemed to modify the prognosis for the better. At first thought, immediate emptying of the uterus and abdominal section would seem to be the desideratum. The fact is, however, that the woman, being in deep shock, abdominal section is simply superadded shock, and the wonder is when any recover. The alternate method is to rapidly extract the fœtus and then to tampon the uterus with sterilized gauze; we thus compress the bleeding-point and perhaps check further loss of blood. Of late years a few cases treated after this fashion have recovered. If we are fortunate thus to check the hæmorrhage, the peritoneum will take care of the blood which has escaped within it; and if the labor has been conducted aseptically and the gauze inserted is aseptic, then, if the woman do not die of shock, she will not die of sepsis. Resort to this method of tamponade is, however, only possible where the intestines have not protruded into the rent. If this has occurred, we cannot use the tamponade, because of the uncertainty as to whether or not the gut is strangulated at the uterine rent or through compression by the gauze. There can be no choice of procedure in case of intestinal prolapse; the physician's only recourse is abdominal section.

In case of incomplete rupture, where the tampon has been applied, the gauze should be left *in situ* for from thirty-six to sixty hours. Adjuvant treatment consists in raising the foot of the bed, bandaging the extremities, giving strychnia in large doses hypodermically ($^1/_{10}$ grain every two hours, for its stimulating effect on the heart), and administering normal salt solution. A full dose of morphia, hypodermically, is indicated against shock, and further assists us in differentiating shock from hæmorrhage. Saline infusion, intravenous, or under the mammæ or into the cellular tissue of the back should ever be borne in mind.

A further and very rare form of uterine rupture is what is termed "annular rupture." This consists in separation of the cervix at the utero-vaginal junction, either in whole or in part. The treatment requisite is ligation of the circular arteries in the event of their being implicated in the rent.

We next pass to the consideration of the puerperal affections due to septic infection which may require surgical aid. A point to be noted is that elective surgery is peculiarly applicable to these affections, since early treatment of this nature very frequently spares the woman results of the most untoward character.

### ENDOMETRITIS AND METRITIS.

Metritis is a direct follower of endometritis. The aborting of either or both is requisite to prevent the extension of the septic process to tubes, ovaries and peritoneum.

Of late years a marked change in therapeutics has arisen. We are less radical, with the result that less damage is done to the woman than was the case under older methods. The radical attack of septic endometritis, then in vogue, has yielded to expectant methods and to the advantage of the woman. Formerly, the first thing, and regrettably still with too many of the general practitioners, was resort to the curette. This instrument is now alone indicated when exploration of the interior of the uterus by the aseptic fingers teaches that there lies in the interior of the organ placental remnant which the finger cannot remove. *The sentient finger has replaced the blind curette.* Recourse to intra-uterine douching, especially of the repeated type, once certified to by high authority, has yielded to rational drainage methods. The illegitimate use of the curette simply opens up new routes of absorption and results in that extension of the septic process which, under the modern, rational, methods, may often be avoided. The repeated douche, or, indeed, the single douche, never accomplished more than the washing away of debris loose in the cavity. Attempts thus to sterilize the uterine cavity were always futile, whilst the disturbance entailed, of the weak and nervous woman, could not but have an unfavorable effect on her morale and place her in a condition of lowered bodily resisting power. To attempt to check a septic endometritis in this way is like trying to quench a fire by sprinkling water on the flames. Further still, since the douches were of some antiseptic solution, the risk of bichloride poisoning, to refer to one agent, was great.

The *cardinal, initial* sign, of a beginning septic endometritis is *fœtor* of the lochia. On its appearance one vaginal douche of sterile salt solution should be ordered to rule out the presence of decomposing clots in the vagina. Should the fœtor persist, the interior of the uterus should be examined by the finger, *if necessary under anæsthesia.* Should pieces of placenta be discovered, as a rule these may be removed by the finger. Otherwise, it is allowable to remove by the curette, and usually the sharp curette is requisite. Should it be found impossible to enter the uterus, owing to contraction of the cervix, if the ordinary dilators fail in yielding the requisite space, without further ado, the vaginal Cæsarean section, which has been amply described, is to be resorted to. Reported cases where, owing to inability to enter the uterus, hysterectomy has been performed are to be condemned as irrational surgical procedures. The uterus having been explored and emptied, the next step is to secure *surgical drainage.* The uterus may be packed with sterile gauze, *plain*, or a rubber drainage tube may be inserted to the fundus and continuous instillation of alcohol, 60 per cent., be established. If the preference be for gauze, iodoform gauze should not be used. It is of disagreeable odor, and far too many cases of poisoning have followed its use. We question if the Pryor method of preparing the gauze, with the aim of utilizing free iodine, is not open to the same objection. If the local effect of iodine be desired, then the plain sterile gauze may be impregnated with iodine. Such gauze packing should be removed in part daily, since it ceases to drain after twenty-four hours, and simply dams back the secretions resulting from the presence of a foreign body in the uterus. This method aims at derivation, but is not as effective as the drainage secured by means of the rubber drain inserted to the fundus. This tube should be perforated, and may be maintained *in situ* by a stitch through it into the cervix. This tube is connected with a gravity syringe, the syringe is filled with 60-per-cent. alcohol and the flow retarded so that the equivalent of about one-half a pint reaches the cavity of the uterus every six hours. We thus have a certain effect on the germs at the surface and possibly on those busy below. In any event drainage is maintained. Meantime, codein in 2-grain suppositories are given by rectum, repeated every five hours where need exists, to quiet pain, broths are administered by mouth, stimulants are given judiciously as the pulse demands, and the temperature rise is kept within bounds by the application of the ice-bag or -coil over the abdomen. Often, as a result of this simple method, the process in the endometrium becomes localized and the woman improves in well-being and goes on to recovery.

Where, on the other hand, the septic phenomena become intensified, we are facing the development of septic metritis and very frequently the sequelæ—ovaritis, salpingitis and peritonitis. Here, again, recent years have witnessed a radical departure from the old-time therapeutic measures. Instead of rushing blindly into hysterectomy with its gloomy outlook, conservatism should prevail. The aim is to allow the septic process to localize itself, so to speak, for the pus to become sterile, when abdominal surgery, if then indicated, enables us to save life and, further, to conserve organs formerly ruthlessly removed.

Under the medical therapeusis just laid stress upon, the general condition frequently alters for the better, especially if the posterior fornix of the vagina be opened widely, and be packed with sterile gauze to establish surgical drainage. This gauze should be removed gradually; as a rule all of it is out in five days. If, as a result of these supporting measures, the condition goes from bad to worse, we are facing a septic peritonitis.

As an adjuvant measure to the treatment, the antistreptococcus serum may be used, or inunctions of the Credé ointment. Such measures do not harm and may do good, although, since we are dealing with mixed infection, their value, in particular the serum, is problematical. In this grade of cases, no wonder the outlook is gloomy, since the septic organisms have been disseminated not alone through the circulation but also through lymphatics. On autopsy septic emboli will be found in every organ of the body, therefore the irrationality of expecting local surgery to effect cure.

When septic peritonitis develops, much may be done to make the subject comfortable, even though cure is very problematical. The methods of treatment devised, such as saline laxatives, large doses of opium, multiple abdominal incision, hysterectomy, all carry an excessive mortality-rate. Here again, if the subject can be tided over until the septic process becomes sterile, a great deal is gained. The old Alonzo Clarke opium method, recently resuscitated by Murphy and Ochsner, carries value. The intestines are, as it were, placed in a splint—given rest; meanwhile the vital forces of the subject are being sustained by easily assimilable food given by the rectum or by mouth. Stimulation under the skin or by mouth is resorted to according to indication, and attempts are made to keep the kidneys in function by the liberal supply of hot normal salt solution given by rectum or into the cellular tissue.

Where the peritonitis is of the local type, that is to say a pelvic peritonitis, the symptoms are often as aggravated as in the general type, and yet recovery is the rule. After abscess formation, it is to be opened and to be drained where it points. This usually occurs in the vagina and is then known as pelvic abscess. A free incision is made, anteriorly or posteriorly, the pus is evacuated, the cavity is mopped out, *never irrigated*, and is then packed with plain gauze saturated according to preference with iodin, alcohol or peroxid. At times, the pointing occurs above Poupart's ligament, when the incision is made there under surgical rule, and the cavity is again packed, or, frequently, it may be drained to advantage into the vagina.

A further type of peritonitis complicating the puerperal state, is that resulting from the rupture of an abscess of some abdominal viscus. Here the indication is the same as such an occurrence aside from the puerperal state, that is to say, abdominal incision, and resort to such surgical measures as are then found indicated.

In general puerperal peritonitis, as a last resort, multiple incision and drainage may be instituted, and sometimes the subjects miraculously recover. In excessive tympanites a coil of gut may be opened to advantage. Whenever the condition of the heart permits the head-elevated position of Fowler should be resorted to. Whilst in this position, normal salt solution, at a temperature of 110°, should be continually instilled, from a gravity syringe, into the rectum.

Suppurating ovarian cysts, necrotic fibroids, entering as complicating factors of the puerperium, are to receive the same surgery as is applicable to them aside from the puerperal condition. The prognosis is modified by the intercurrent puerperium.

## Puerperal Mastitis.

This condition is the result of infection, the germ gaining entrance through the lacteal ducts or through abrasions of the nipple.

The infectious process may be aborted or its end-result is suppuration. In the latter event we have the condition known as ammary abscess.

Th [illegible] varieties, the glandular and the sub-glandular. monly met with, and is readily recognized, ms an insidious course, often undermining ence is recognized.

As abortive measures, the application of the ice-bag may be noted, unless hot applications are preferred, and, as soon as the presence of pus is determined, it should be evacuated under surgical rule, the incision always radiating from the nipple to avoid destroying the lacteal ducts.

The subglandular variety in its end-result undermines and destroys the entire gland. Further still, at times, perforation occurs into the pleural cavity. In obscure cases where, under local treatment the signs of inflammation persist, it is advisable to aspirate deeply with the needle under the gland to discover the pus. When found, the surface of the gland is rendered aseptic, and free incisions should be made radiating from the nipple. The cavity is thoroughly irrigated, washed out with peroxid of hydrogen, or, preferably, mopped out with pure carbolic acid and then packed with alcohol gauze. Compression is then applied. In the extreme varieties, numerous counter-openings must be made irrespective of the lacteal ducts.

The Bier method of treatment, described elsewhere at length, is eminently applicable to mammary abscess.

As the principles of asepsis of the nipple during lactation and of the child's mouth are understood and applied by nurses and by physicians, mammary abscess will become one of the rarest complications of the puerperal state in private practice even as, already, it has in well-conducted maternity institutions. There, as a rule, it only develops when the woman has infected her breast through touching them with her dirty hands.

# CHAPTER XX.

## ECTOPIC GESTATION.

Ectopic gestation,—extra-uterine pregnancy, is well-nigh the most malignant disease to which woman is subject, barring cancer. This statement is made with the sole reservation—provided its presence be not recognized by the attending physician. Where its presence is determined and the only proper therapeusis is applied, other things equal, the woman's life may be saved. In view of the fact that the major part of obstetric work of necessity falls to the lot of the general practitioner, it seems advisable that extra-uterine pregnancy should be considered in a work dealing with the surgery of obstetrics.

From a therapeutic standpoint, it is no longer necessary to do more than to refer, in order to condemn, to the methods resorted to in the past for the cure of this condition. Electricity, puncture of the ectopic growth, the injection of morphia—these and other methods were tried and they failed to meet the indication, which is to stop the hæmorrhage, but in all fairness it should be stated that those who advocated such methods did so before the present status of abdominal surgery had been reached. It is easy enough to condemn the methods of the giants of other days, but it becomes us to bear in mind the fact that they had not the light of knowledge which we possess and that within their limitations they acted according to the right. The knowledge we have secured to-day teaches that there is but one method, with few exceptions, and these will be noted, of treating this condition, and this is through abdominal surgery. Under a certain event, expectancy may justly rule, but, otherwise, the life of the subject depends on the institution of surgical measures.

There are two varieties of ectopic gestation, the ovarian type and the tubal type.

PLATE XLVII.

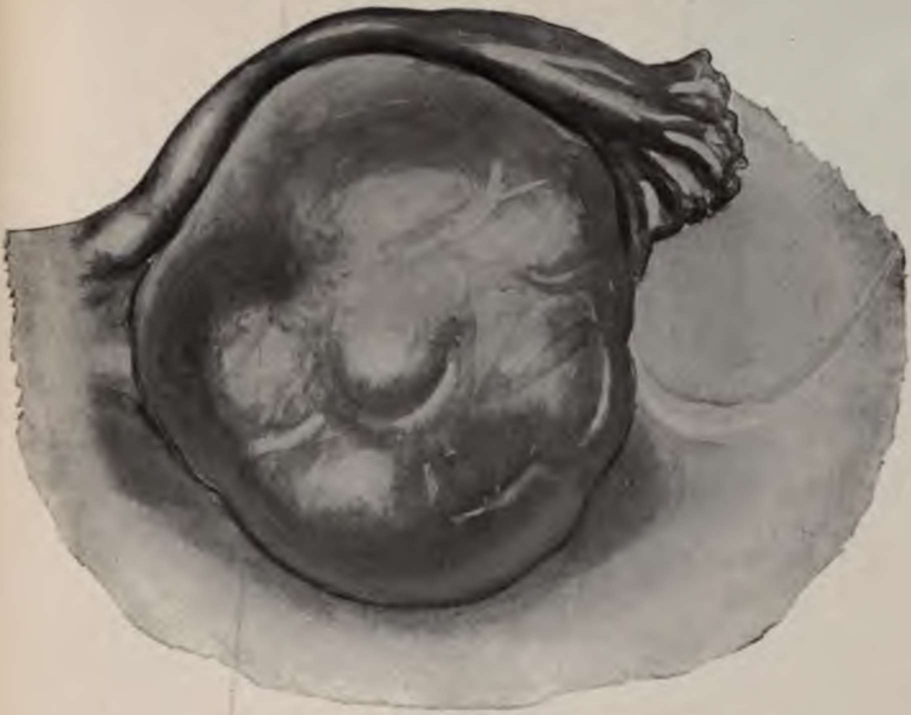


*Fig. 1.—Ovarian Pregnancy. External View. Right Side. (Webster.)*

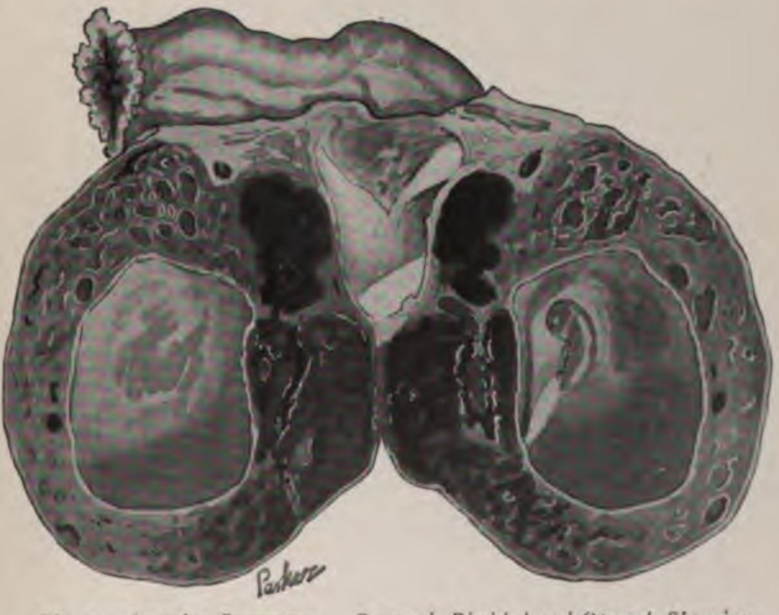


*Fig. 2.—Ovarian Pregnancy. Ovary is Divided and Opened, Showing the Amniotic Cavity and Embryo. (Webster.)*

## OVARIAN PREGNANCY.

Up to within the past few years the possibility of the occurrence of ovarian impregnation was disputed. In fairly quick succession, Van Tussenbroek of Holland, Webster of Chicago, and Thompson of Maine, reported cases, certified to by elaborate microscopical and histological examinations, which prove beyond the shadow of a doubt that the ovum may be impregnated as it leaves the Graafian follicle and before it reaches the tube, to develop within the ovarian stroma. These cases raise the question whether the occurrence be not more frequent than from the record appears evident, since ovaries removed with large hæmatomata, if subjected to careful examination, may turn out to be instances of ectopic ovarian pregnancy. As will be noted, the therapeutic indication is the same as though the condition existed in the tube, and, to judge from the few hitherto recorded instances, the symptomatology does not vary.

## TUBAL GESTATION.

From the present point of view, primarily the vast majority of instances of ectopic gestation are tubal. The impregnation may occur at any portion of the tube—near the uterine cornu, involving the substance of the organ, and hence denominated interstitial pregnancy, at the middle of the tube, leading as a rule to rupture, at or near the fimbriated end, resulting in extrusion into the peritoneal cavity—known as tubal abortion.

The symptomatology is uncertain, irregular and, as stated in many text-books, is fallible. Thus we are told that *amenorrhea* is a symptom of extra-uterine pregnancy. On the contrary it is a symptom of uterine pregnancy. In a large proportion of instances the history does not offer amenorrhea in the strict sense of the term. On careful questioning it will be elicited, on the contrary, that the subject anticipated by a few days or retarded. Therefore *arythmia* in type of menstruation should be substituted for *amenorrhea*. Thus, the woman tells us that her habit for years has been to flow every twenty-eight days, with four days duration. She denies having passed a period but admits that it was advanced two to three days or retarded similarly and instead of having flowed four days she only flowed one or two. Within a day, or a few weeks—two, perhaps three, she begins to spot or flows profusely for a day or so. This at once subjects the woman to suspicion of ectopic pregnancy. Often, on further question, we find a history suggestive of pelvic disease, and as a rule, although married for a number of years, she has never conceived or not for a protracted period. Finally, she begins to have attacks of abdominal pain characterized by their colicky nature—"green apple" pain. This symptom points distinctively to the tube and is due to stretching of the pregnant tube and eventually means primary rupture. This is the golden time for operation. The other rational symptoms of pregnancy, such as nausea and vomiting, and the physical appearance of alteration in the mammary glands may never offer. Perhaps, and this is exceptional, she tells us that she has passed shreds at the time of the atypical bleeding—the so-called decidua. The rarity of this may be exemplified by the statement that in a series of ectopic pregnancies seen by the authors, exceeding three hundred in number, such decidua has only been seen four times.

So far then, atypical and arythmic menstruation, and irregular spottings or hæmorrhages, associated with colicky pains in the abdomen, are the rational signs of the presence of ectopic gestation. At times, the most careful questioning fails to reveal even this symptomatology.

On local examination the uterus is found to be slightly enlarged—*sympathetic congestion enlargement*, but, unless the woman be also pregnant in the uterus, and such combined cases are not very infrequent, the uterus does not offer the spherical shape characteristic of intra-uterine pregnancy nor are the changes in the lower uterine segment, known as Hegar's sign, present. If the attendant is fortunate enough to be able to examine the discharges microscopically he will not find chorionic villi as he will be apt to do where the instance is one of uterine pregnancy in the process of aborting. Further, local examination, except where the subject is very stout, will reveal the presence of a mass to one or other side of the uterus, or posteriorly. This mass is soft, congested, as shown by the pulsation. Rectal examination, will enable the attendant the better to map out this mass since thus he is able to examine better the region of the broad ligaments. If at all in doubt the subject should be at once anæsthetized for examination, since accurate diagnosis prior to rupture, in any event prior to secondary rupture, is very essential. If still in doubt, whilst the subject is under anæsthesia, an aseptic incision is made into the posterior fornix, and the tubes are brought down and examined. Should primary rupture have occurred free blood or clots will be secured and the diagnosis is certified.

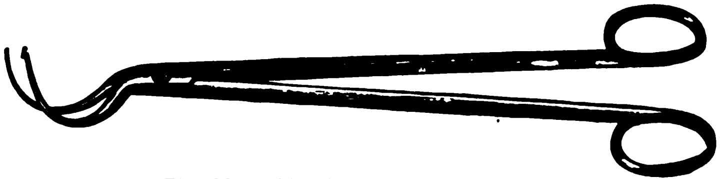


Fig. 115.—Cleveland's ligature-carrier.

Rupture of the ectopic sac occurs between the sixth and the tenth week. As before stated the tube may not rupture but the ovum be extruded and the hæmorrhage occur through the fimbriated end of the tube, *tubal abortion.*

Rupture occurs into the general peritoneal cavity, or between the layers of the broad ligament. The ovum dies or, rarely, it forms attachment to some neighboring organ and the pregnancy continues towards term.

The effused blood, if progressive, may fill the entire abdominal cavity, or hæmorrhage may cease, the blood gravitate into the space of Douglass when exudate is thrown out and we have the condition known as pelvic *hæmatocele*, or, where the rupture has been into one or the other broad ligament, the hæmorrhage finds its limits within the boundaries of these ligaments. Such condition may be called *hæmatoma.*

Not infrequently the subject is gravid in both tubes. Rarely twins are found in one tube.

According as we have free hæmorrhage into the cavity or the formation of hæmatocele or hæmatoma the surgery called for differs. In the first event the surgical rule of cutting down on the bleeding point and checking the source of the hæmorrhage holds; in the latter event expectancy should rule since Nature often causes the absorption of the blood effused. Should this not happen and the case go on to suppuration exit is to be given to the pus, as will be noted further on.

As a rule, where the rupture is intra-peritoneal, the symptoms of hæmorrhage—fainting, sighing, rapid pulse, increasing pallor are more suggestive than when the rupture is into the broad ligament, when the hæmorrhage is slower and, therefore, the constitutional symptoms more gradual in evidence. The formation of a tumor in one or another broad ligament, points to broad ligament rupture. The formation of a tumor in Douglass' fossa, with subsidence, or rather arrest in the major symptoms, points to hæmatocele formation. Here expectancy may rule. Where doubt exists, and this we insist upon, a posterior vaginal section should be made aseptically. If we secure free blood or clots, the diagnosis is certified. If we secure negative result, the woman has not been injured in the least, except in so far as the risk of anæsthesia enters, and yet we have placed her life on the right side of the balance.

After primary abdominal rupture, in the instances where the hæmorrhage is not fatal and the extruded ovum engrafts itself on other organ and thence nourished progresses to term, the diagnosis may be self-suggestive or very obscure. If the fœtus lives the heart-sounds may be heard and fœtal movements may be appreciated, but, often short of exploration of the uterus, gestation in this organ cannot be excluded. Here expectancy should rule. After fœtal death, at or after term, whilst the precedent history may suggest the possibility of ectopic, in the majority of instances, abdominal section will alone make the diagnosis. But then this is indicated, owing to the presence of an abdominal tumor.

*Differential diagnosis.*—The following conditions may stimulate ectopic pregnancy: Uterine abortion: The rupture of some abdominal viscus and extrusion of its contents into the peritoneal cavity, with resulting peritonitis. Locally we are called upon to differentiate hæmatoma of the broad ligament from causes other than ectopic gestation, exudate into the cellular tissue of the ligaments, cyst of the broad ligament or abscess within it.

Attention to the rational history and careful bimanual exploration, vaginal and rectal, if need be under anæsthesia, ought to suffice for differentiation. In case of peritonitis, elevation of temperature will exist from the outset. Exploration of the uterus will exclude abortion, as also examination of the discharges under the microscope for chorionic villi. If some viscus has ruptured, as the vermiform appendix, should the previous history not assist, the therapeutic indication is the same, that is to say, abdominal section. The presence of a tumor in one or in both broad ligaments calls for abdominal exploration, although the urgency is not the same as it may be in case of ectopic gestation. Where combined extra- and intra-uterine gestation exists, usually no matter how refined our diagnostic sense, exploration of the uterus, even though abortion is thus caused, or abdominal exploration will alone settle the question.

Where the diagnosis of ectopic gestation is established or is strongly suggested, the woman must be regarded as in greater or less risk according to the period of gestation attained. As noted above, rupture occurs as a rule about the tenth week. Therefore the nearer this term the greater the likelihood of intra-peritoneal hæmorrhage.

Very infrequently the ovum dies prior to rupture, and might become absorbed, but the subject retains a damaged tube, eventuating, perhaps, in a pyosalpinx.

*Treatment.*—Barring hæmatocele formation the only *safe*, *logical* and *rational* method of treating ectopic gestation is by abdominal section. It is granted that, in the stage precedent to rupture, especially where the vagina is capacious, sagittal section and longitudinal section of the vagina will enable us to bring down the damaged tube and remove it, but *cui bono?* The vaginal vault is mutilated, more time is requisite, entailing protracted anæsthesia at the expense of the subject's kidneys, whereas a small, rapidly made abdominal incision enables the operator to work quickly, and to view the other organs which not unlikely require attention. In advanced cases, where the peritoneal cavity is filled with blood often up to the ensiform cartilege, and where plastic exudate has been thrown out, there remains absolutely no excuse for attempts at surgical legerdemain through the vagina.

For the abdominal operation the requisite preparations of the skin and the hands of the operator and assistants are resorted to. The aim is to check hæmorrhage and not to superadd infection. The instruments required are a bistoury, a few artery-forceps, a ligature-carrier, a pair of scissors, some needles, and suture material, catgut, plain and chromicized. In emergency work a ligature-carrier is not required. The abdomen is opened in the midline, the ruptured or aborting tube is brought out and it is ligated *lege artis.* The ovary is not disturbed where it is healthy. The other appendages are looked at since double ectopic may be present or they may be diseased, and if so they are similarly removed. The accessible clots are scooped out, and if the subject be in shock, a pint or so of sterile salt solution is poured into the peritoneal cavity, and the incision is sewn up in layers, using number one plain gut for the peritoneum, number two chromic gut for the fascia, and subcuticular plain gut for the skin. Protracted attempts should not be made to remove the effused blood or clots. These are aseptic, if not infected by the operator, and Nature takes care of them far better than she will tolerate unnecessary delay in the peritoneal cavity. Drainage is rarely requisite. During the performance of the operation, where need be, hot normal saline solution may be instilled into the system, by rectum, into the cellular tissues, under the mammæ or in the loins, or into the vein according to individual preference. After the source of the bleeding has been checked stimulation of this character assists. While bleeding is progressive such measures by heightening blood-pressure cause more hæmorrhage. The woman is placed in bed and the ordinary treatment applicable to abdominal sections is instituted.

At times the operation is facilitated by using the Trendelenberg posture and for emergency use this may be secured by tying an ordinary kitchen chair to the table as is shown in the figure.

Where the subject is not seen until secondary hæmorrhage has occurred and she is in deep shock, opinion varies as to the wisdom of immediate operation. Some contend that to operate in the midst of shock intensifies the shock. If we were certain that the hæmorrhage had ceased, expectancy might be advised until the woman emerges to a degree from the shock. And it may be stated that usually deep shock means that hæmorrhage has ceased. Since, however, this is a matter of deep uncertainty, other things equal, we prefer rapid section associated with stimulating measures.

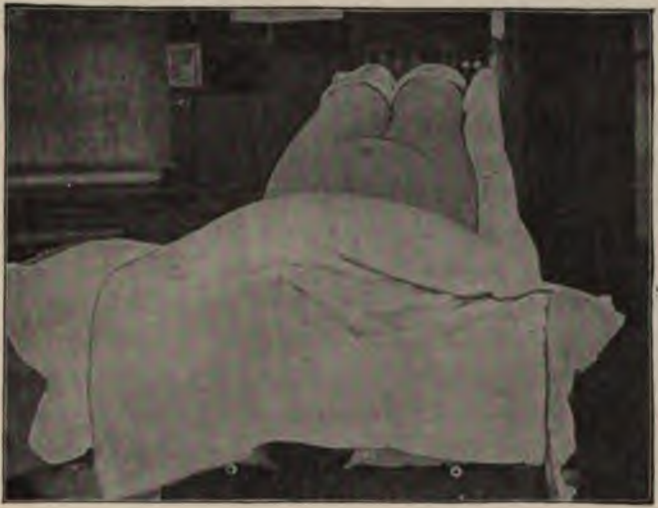


Fig. 116.—Emergency Trendelenberg posture. (The inclined plane is formed by an ordinary chair being tied on a kitchen-table.)

Where the hæmorrhage has occurred into one or the other broad ligament, or where hæmatocele has formed, expectancy should rule. Here, so long as the physical signs of suppuration do not offer, Nature should have a chance to cause the absorption of the blood. When temperature-rise or accelerated-pulse, and blood-count—that is to say polynuclear percentage higher than leucocyte-count, offer, the time for action has arrived and here the vaginal route is that of election. Aseptically an incision is made into the tumor presenting, its contents are evacuated, the cavity is mopped out with sterile salt solution and is then packed with plain sterile gauze. This gauze is gradually removed. The subject is left with a damaged broad ligament which possibly at some future date will require exsection.

In a small proportion of instances the ovum survives the rupture and continues to develop. The subject is now in danger of further rupture into the peritoneal cavity. Every day the increasing size of the placenta adds to this danger. That the child will reach full term is problematical, and even if it do, when false labor pains set in, the chances of its death are almost exact. All that the attendant may do is to watch the woman carefully. If evidence of internal hæmorrhage offer, his duty is to open the abdominal cavity and act according to the findings, that is to say exsect the sac if possible, otherwise to tie the bleeding points and to pack the sac, which, it is to be remembered, is as it were extra-peritoneal in the sense that it is shut off from the general cavity. If the sac cannot be exsected, its edges are stitched to the abdominal incision and free drainage is to be maintained until the placenta sloughs away.

If the child has reached full term and is alive the question is whether it is advisable to open the abdomen in order to give it a chance of survival. It is to be borne in mind that the attachments of the sac are unknown. It is certain that these are very vascular. It is known that if the child die the chances are that the placenta will lose much, if not all, of its vascularity and that therefore the woman's chances are probably best subserved by expectancy. This child is simply a parasite of ill omen to the woman. Sentimental considerations should not enter into the decision nor should the little notoriety derived from the performance of a brilliant operation. No one denies, except those whose religion bars interference with pregnancy under any consideration where the fœtus is alive, even though thus the woman loses her life, the propriety of emptying the uterus where the woman is gradually dying from the effects of the protracted vomiting of pregnancy. With charity toward the religious convictions of all, it is our opinion that the child should be allowed to die in order that the chances of the woman being spared may be enhanced. It goes without saying that the case should be fairly and frankly stated to those immediately concerned.

After the child has died and the placental circulation has greatly ceased the danger to the woman from operation is lessened. Nature is here to be given a chance but, on the supervention of symptoms pointing to toxæmia, the abdomen should be opened and the sac removed or drained according to the conditions found. When it is deemed wiser to drain the sac this may be done to advantage, when feasible, through the vagina.

## Prognosis.

Operation, other things equal, before rupture should not carry a mortality-rate. Where expectancy or timidity rules the mortality-rate enters as a distinct factor, and this varies with the amount of blood lost. Vaginal section into hæmatocele should not carry a mortality-rate unless refrained from until deep infection has occurred. Operation in advanced cases always entails loss of life varying in degree according to the stage of gestation, according to the character of the rupture, and according to the extent and nature of the attachments to the surrounding organs.

Once again our teaching as to the value and the necessity of *election* in obstetric surgery has been certified.

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